A REPORT OF THE
SCIENCE TALENT SEARCH EXAMINATION
1964

Dr. K. N. SAXENA

8507

Department of Science Education
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH & TRAINING
H 2/3, Model Town, DELHI-9.

A REPORT OF THE SCIENCE TALENT SEARCH EXAMINATION

1964

539

K. N. SAXENA
M. A., B.Sc., M.Ed., Ph.D.,
Field Adviser,
Department of Science Education, N.C.E.R.T.,

Library
25/1, B. C. Road

Department of Science Education
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH & TRAINING
H 2/3, Model Town, DELHI-9.

Science Talent Search Series 9

Published by
Department of Science Education,
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING
H 2/3, MODEL TOWN, DELHI-9.

First published—November, 1964—2,000 copies

NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING, 1964

Printed by Hindustan Publishing Corporation (India),
at Hindustan Scientific Press, Jawahar Nagar, Delhi-6.

[illegible]
[illegible] 5.10.2007
[illegible] 12673

FOREWORD

The Science Talent Search Scheme was implemented by the National Council of Educational Research and Training through its Department of Science Education during 1962-63 as a pilot project in the territory of Delhi. The main purpose of the Scheme is to locate academically bright children in science at the close of the secondary stage of education. Another purpose of this Scheme is to provide suitable encouragement to the selected students for pursuing courses in basic sciences. On the basis of the results obtained by the analysis of the data of this pilot study, the Scheme was extended all over the country during 1963-64 and the 1964 examination was held all over the country on 23rd February, 1964.

6,894 students appeared from all over the country and out of this large number, top 1,172 candidates were called for interview on the basis of the marks secured in theory papers. Finally, 354 candidates were awarded scholarships and certificates of merit. The present report is a statistical analysis of the entire Science Talent Search Examination data of 1964. The statistical findings reported here may be of interest to research scholars, teachers of science, school administrators and educationists. In this report inter-correlations between the psychological tests, the Science Talent Search tests, academic records, teachers' ratings, socio-economic conditions and personality indicators have been worked out. Detailed item-analysis of the Science Aptitude Test items has been done. The items, selected on the basis of suitable discriminative and difficulty values, may be used by the Secondary Boards of Education for partial replacement of the traditional essay type questions.

It is hoped that this report will be found to be useful by the teachers, educationists, educational administrators, psychometricians and research workers interested in mental measurement and science education.

R. N. Rai
Head of the Department
Department of Science Education
National Council of Educational
Research and Training,
H 2/3, Model Town, Delhi-9.

30th November, 1964.

PREFACE

This is the second report on Science Talent Search Scheme sponsored by the National Council of Educational Research and Training. The first report was published in the year 1963 and it was found to be useful by educationists, educational administrators, scientists, teachers and research workers.

This year 6,894 students appeared at the Science Talent Search Examination. This report is an outcome of a detailed evaluation of the selection techniques used for screening out potential talents from amongst those who took the test. It is hoped that the present findings will have their impact on the teaching-learning process by creating a suitable groundwork for improved curriculum, better evaluation techniques and shifting of emphasis from rote learning to scientific comprehension and critical thinking.

Although the results of the analysis have not been, in certain cases, in conformity with the traditional beliefs and hypotheses, they have been faithfully reported and attempts have been made to reconcile such departures from the established views.

One of the important features of this report is the determination of the prognostic values of the tools of selection, both from the point of view of the conceptual analysis of the test items and the empirical analysis thereof. Some measures have been suggested to improve the prevailing devices of selection and in Appendix XII some important further research studies have been suggested that will unfold the adequacy or otherwise of the tools of selection. Further research on these problems will bring about improvement in the selection techniques and the follow-up process.

The inter-correlations between various variables, *e.g.* personality traits, extramural activities, individual experimentation etc., and achievement on the Science Talent Search tests and the traditional types of home and public examinations, indicate that certain traditional practices and values prevalent in our educational system need a reorientation to suit the changing pattern of education brought about by the impact of science and technology.

It is hoped that this report will be of interest to research workers, teachers, educationists, scientists and educational administrators who are concerned with the task of National Reconstruction.

K. N. Saxena
Field Adviser
Department of Science Education,
National Council of Educational
Research and Training
H 2/3, Model Town, Delhi-9.

November 30, 1964

CONTENTS

Page

FOREWORD iii

PREFACE v

Chapter

1 THE SCHEME **1—3**

1.1 Introduction 1

1.2 The Science Talent Search Scheme 1

1.3 Objectives 2

1.4 Other outcomes 2

1.5 Abilities and skills to be tested 3

2 TECHNIQUE OF SELECTION **4—11**

2.1 Selection procedure 4

2.2 The cut off point for the first stage screening 4

2.3 The science aptitude test 4

2.4 Scoring 6

2.5 The essay type test 6

2.6 The project report 7

2.7 The interview 7

3 SELECTION RESULT **12—13**

3.1 The merit list 12

3.2 Value of scholarship 12

3.3 Follow-up of awardees 12

3.4 Proposals for the expansion of the Scheme 13

4 ACCELERATED PROGRAMME FOR THE AWARDEES **14—16**

4.1 Education of the promising and bright children 14

4.2 The pivot 14

4.3 Possible solutions 15

4.4 The follow-up of the accelerated programme 16

5 PARALLEL SCHEMES IN INDIA AND ABROAD **17—31**

5.1 (A) The Science Talent Search—U.S.A. 17

5.2 (B) The National Merit Scholarship Programme, U.S.A. 20
5.3 (C) Jagdis Bose National Science Talent Search, West Bengal 28
5.4 (D) Science Olympics 30
5.5 (E) British Association Competitions (U.K.) 31

6 INTERPRETATION OF THE DATA 32—41

6.1 Areawise distribution of items on science aptitude test 32
6.2 Distribution of thought-type items in the science aptitude test 32
6.3 Analysis of the merit list 33
6.4 Statewise distribution of the contestants and the awardees 33
6.5 Interboard variations in the distribution of scores on different subtests 35
6.6 A follow-up study of 1963 awardees, who joined basic science courses 36
6.7 Further research projects 37
6.8 Item-analysis of the science aptitude test 37
6.9 Reliability of the science aptitude test 37
6.10 Empirical and predictive validity of the test scores 38
6.11 Inter-correlations of the sub-tests of Science Talent Search 38
6.12 Correlation between S.T.S. scores and the income level of the parents/guardians of the awardees 39
6.13 Some Correlational figures at a glance 39

APPENDICES 42—165

I A short account of the workshop organised for the Science Talent Search students from October 3 to October 12, 1963 42
II Sample items from the science aptitude test, 1964 44
III Sample topics of essay-type test 49
IV A sample project report 50
V Areawise items of the science aptitude test, 1964 62
VI Thought type items—an analysis 63
VII (A) The merit test (for the award of scholarship) 64
VII (B) The merit list (for the award of certificates of merit) 73
VIII Analysis of the merit list, taking slabs of 50 ranks in seven groups (in order of merit) to indicate the educational courses opted by the awardees 78
IX Statewise distribution of the contestants and the awardees 79

X Measures of central tendency and variability of scores interview-boardwise (zonal) 80

XI Followup predictive study of the science talent search scholars 1963 (marks obtained in B.Sc. Part I and Science Talent Search Exam. 1963) 107

XII Needed research 108

XIII (a) Item-analysis data for the discriminative and difficulty values of items of the science aptitude test 111

XIII (b) An analysis of the items selected and rejected on the basis of discriminative and difficulty values 115

XIV Data for the reliability of the science aptitude test 116

XV Figures at a glance; 120

correlational tables 121

XVI Frequency distribution of monthly income (*in rupees*) of the parents/guardians of the S.T.S. awardees 126

Table showing S. No., monthly income and composite score on Science Talent Search tests 127

XVII Correlational figures—at a glance ; 132

correlational tables ; 134

1

THE SCHEME

1.1. INTRODUCTION

With the progressive democratisation of educational opportunities and with the industrial and technological advancements achieved in the sphere of National Reconstruction, it has become imperative that the scientific potential of the country should be geared up by suitably building up a band of future research workers in basic sciences. This needs careful planning and action in advance.

One such vital step is to locate the students with scientific bent of mind at an early stage and then to nurture these talents so that they may develop into potential scientists. Empirical experience has shown that the secondary stage of education appears to be the right stage for identifying the talents in the field of basic sciences.

It is at the secondary stage of education that the potentialities of the child unfold and reveal themselves and could be helped to grow to the full extent of which the child is capable. It is also an admitted fact that education of the bright and promising children is as old as education itself. What is required is the proper process of identification of the talents and then to provide opportunities for the potentialities to be developed within the existing framework of the institutional programme and extramural activities.

1.2. THE SCIENCE TALENT SEARCH SCHEME

In order to identify promising students in science and provide them necessary encouragement for pursuing higher studies in basic sciences, the National Council of Educational Research and Training, through its Department of Science Education, has formulated a scheme of Science Talent Search. Under this Scheme, a number of scholarships and/or certificates of merit are awarded to meritorious students who possess a marked aptitude for science. A pilot project was conducted in the territory of Delhi during 1962-63 and with the experience gained, the Scheme was extended throughout the country during 1963-64. It has been decided to hold a competition once every year for the award of scholarships and/or certificates of merit. One of the main purposes of the Scheme is to locate the scientific talents. Another objective of the Scheme is to provide facilities to these talented individuals so that they can blossom into creative scientists.

During the formative years of undergraduate studies, it is imperative for every institution that the academically bright students get the individual attention of the teachers and also suitable environment for the growth of their capabilities. Alongside, the Department of Science Education, National Council of Educational Research and Training is also trying to nurture the scientific talents by providing such academic opportunities to the awardees as are not ordinarily available in our institutions. One such step is the organisation of the Workshops and Summer Institutes in different parts of the country under the leadership of eminent teachers and scientists. One such Workshop was organized in October, 1963 at Delhi University and the results have been found to be very encouraging and useful. A brief report of the workshop is given in Appendix I.

1.3. OBJECTIVES

The main objectives of the Scheme are:

* to identify boys and girls at the close of the secondary stage who possess a marked aptitude for science,
* to stimulate scientific talent by competitive processes and recognition of merit,
* to encourage institutions to take more active interest in the search for scientific ability,
* to create awareness in institutions of the need for providing challenging opportunities to the talented students in science, and
* to help in building up a body of future scientists who may contribute to the scientific advancement, both in the pure and applied fields.

1.4. OTHER OUTCOMES

Certain other outcomes are also expected to emerge out of this programme, the most important of which are likely to be:

* to create a consciousness for improving the syllabi of science subjects, methods of teaching and evaluation techniques,
* to provide colleges, universities and technical institutions with a means of contacting science students of high ability,
* to mobilize the interest and support of higher centres of learning and other science agencies for the development of scientific talent.

1.5. ABILITIES AND SKILLS TO BE TESTED

The programme will seek to assess:

- the pupil's aptitude for science,
- his/her awareness of the basic nature of sciences,
- his/her creativeness and mental alertness in the investigation of the scientific phenomena,
- his/her powers of scientific reasoning, critical thinking and his/her skill in scientific experimentation,
- his/her ability to understand scientific concepts precisely,
- his/her ability to apply knowledge to analyse and interpret scientific data, and
- his/her knowledge about the recent developments in the various branches of pure and applied sciences.

2

THE TECHNIQUE OF SELECTION

2.1. SELECTION PROCEDURE

The selection procedure as adopted in the year under review, consisted of three stages viz., screening on the basis of

(i) the marks secured in science subjects in class X or equivalent

(ii) the theory marks secured in

  (a) The Science Aptitude Test

  (b) The Essay Paper

  (c) The Project Report

(iii) the final Interview.

The number of students called for interview was decided in such a way that the selection ratio at the final stage corresponded to the ratio 1 : 3.

2.2. THE CUT OFF POINT FOR THE FIRST STAGE SCREENING

On the basis of the pilot study conducted in 1963, it was found that the probability that a student with a score less than 55% in science subjects at the High School stage will compete successfully in the final selection is less than 5% and hence it was decided that 55% should be an appropriate point for the first stage screening. This cut off point also helped in keeping the number of contestants for written tests within reasonable limits of financial and administrative control.

2.3. THE SCIENCE APTITUDE TEST

This helps to discover:

- the pupil's aptitude for science,
- his/her interest in pursuing science beyond the routine curriculum
- his/her powers of scientific reasoning,
- his/her ability to understand scientific concepts precisely,

- his/her ability to use the scientific approach in checking hypotheses in interpreting data, and in applying principles, and
- his/her capacity to judge assumptions underlying conclusions.

The questions in the 1964 test related to 14 different areas of science, viz., Physics, Chemistry, Mathematics, Botany, Zoology, History and Philosophy of Science, Bio-Chemistry, Bio-Physics, Physiology and Hygiene, Astronomy, Geology, Metereology, Agriculture and Engineering.

The test was of three hours' duration and consisted of multiple choice items of factual and thought-type. Students were expected to have a much deeper comprehension of scientific topics than is usually required in the traditional type of examinations. The Science Aptitude Test had only objective type questions. The answer to each question was to be marked by putting a cross (x) in one of the squares provided against the four plausible answers to each question. The entire test consisted of 160 items, out of which 65 were of factual type (Part A) and 95 were of thought-type (Part B). The questions were set only in multiple choice form with four alternatives to each question. The various areas of science were arranged in the following sequence:

Major Area	*Questions in Part A (factual Type)*	*Questions in Part B (Thought-type)*	*Number of passages (Thought-type)*	*Total number of items*
1	2	3	4	5
Physics	10	10	4	20
Chemistry	10	10	4	20
Mathematics	7	7	2	14
Botany	4	4	1	8
Zoology	4	4	2	8
Meteorology	5	5	2	10
Astronomy	5	5	2	10
Geology	5	5	4	10
Physiology & Hygiene	5	5	2	10
Engineering	5	5	2	10
Agriculture	5	5	3	10
History and Philosophy of Science	0	10	3	10
Bio-Physics	0	10	4	10
Bio-Chemistry	0	10	3	10
Grand Total	65	95	38	160

It will be observed that the number of questions of thought-type are 59% of the total number of items while that of factual-type are only 14%. This is a healthy characteristic of the Science Aptitude Test because it is always better to frame items which can test the powers of comprehension, reasoning, critical thinking and analysis-synthesis rather than factual knowledge alone. The items on each of the areas were set by a panel of three setters, drawn from universities or centres of higher learning, who had experience of framing objective type items. The pooled items were then scrutinized by experts in science. As far as possible care was taken to select the setters who were experts in subject areas and were also in close touch with the secondary system of education. Each setter was required to set twice the number of questions to be finally included in the Science Aptitude Test, leaving sufficient scope for discarding inadequate items.

Some sample items from Science Aptitude Test 1964 are included in Appendix II.

2.4 SCORING

The scoring of this test was very simple because every correct answer carried one mark. However, in such tests there is an element of guessing and this can be remedied by applying a formula. In order to correct the obtained scores for guessing, the following formula was utilized:

$$S = R - \frac{W}{N-1}$$

where S = corrected score, R = number of right answers, W = number of wrong answers and N = total number of alternatives provided in each item *i.e.* 4 in the present test.

It has been decided that from 1965 contest and onwards another experiment will be tried out *viz.*, the test will be divided into two Parts A and B. Part A will consist of items on thought-type only and on 14 different branches of science. This Part will be compulsory for all the students. Part B will have 4 sections *viz.*, Physics, Chemistry, Biology and Mathematics. Each contestant can choose any one of the four sections and answer all items in that particular section. This section will have items of multiple choice, both factual and thought-type.

2.5 THE ESSAY TYPE TEST

The 1964 test was of two hours' duration. The candidates were asked to select one topic out of the four suggested and write an essay on it of about 2,000 words in English or in any one of the regional languages as approved by the Constitution. The essay paper was set on scientific topics which were chosen to test a wide spectrum of knowledge and comprehension. Alongwith the topics, some important outlines were also given so that the contestants might develop their essays along those lines. Some essay topics are included in the Appendix No. III to give an idea of the nature of the questions asked.

2.6 THE PROJECT REPORT

Each contestant had to submit a written project report on a scientific topic to be chosen by him/her. The project reports were either based on experiments carried out by the contestants on scientific topics or on observational data, its systematic analysis and interpretation. The reports were meant to evaluate the originality and scientific creativity of the candidates as conditioned by his/her scientific experiences either at school or at home. The students were given the option to take the necessary guidance from their science teachers for the completion of such a report.

Some of these reports are being published by the Department of Science Education so that the future contestants may get some guidance while writing their own reports. It may be pointed out that the quality of the project reports this year was not upto the mark. The reasons are obvious: the first being that the students do not get ample opportunity to work in the school laboratory (out of the school hours) and secondly there is very little initiative on the part of the teachers to stress on the individual work by the students. The good reports have mostly come from those contestants who had the opportunity of getting good guidance either from an enthusiastic science teacher or from a guardian who had sufficient background of science. One such report is included in Appendix IV for illustration.

2.7 THE INTERVIEW

On the basis of the written tests, 1172 students were called for interview at six centres *viz.*, Delhi, Ahmedabad, Bangalore, Calcutta, Dehra Dun, and Gauhati. The composition of the different boards is given below :

MEMBERS OF THE INTERVIEW BOARD

DELHI

Chairman,

Dr. D.S. Kothari,
Chairman,
University Grants Commission,
New Delhi-1

Members

Dr. H.J. Taylor,
Vice-Chancellor,
Gauhati University,
Gauhati

Prof. N.R. Dhar,
Director,
Sheila Dhar Institute of Soil Science,
Allahabad (U.P.)

Prof. B.D. Nagchaudhuri,
Director,
Saha Institute of Nuclear Physics,
Calcutta-9

Prof. P.L. Bhatnagar,
Prof. of Applied Mathematics,
Indian Institute of Sciences,
Bangalore

Prof. J.J. Chinoy,
Prof. of Botany and Director of
School of Sciences,
Gujrat University,
Ahemdabad (Gujrat)

Shri Raja Roy Singh,
Joint Director,
National Council of Educationa
Research and Training,
New Delhi

Dr. M.C. Pant,
Deputy Director,
Department or Science Education,
National Council of Educational
Research and Training,
Delhi

Shri N.K. Sanyal,
Field Adviser,
Department of Science Education,
National Council of Educational
Research and Training,
Delhi

Dr. K.N. Saxena,
Field Adviser,
Department of Science Education,
National Council of Educational
Research and Training,
Delhi

Prof. B.M. Johri,
Prof. of Botany,
University of Delhi,
Delhi

Shri
~~Prof.~~ G.N. Sharma,
Science Consultant,
Directorate of Education,
Delhi

Shri R.K. Kaul,
Principal,
Government Teachers' Training College,
Ajmer (Rajasthan)

Member Secretary

Dr. R.N. Rai,
Head of the Department of Science Education,
National Council of Educational Research and
Training,
Delhi

BANGALORE

Chairman

Prof. P.L. Bhatnagar,
Prof. of Mathematics,
Indian Institute of Sciences,
Bangalore

Members

Prof. S. Krishnaswamy,
Prof. of Zoology,
University of Madras,
Madurai

Dr. C.B. Rao,
Joint Director of Public Instruction,
Andhra Pradesh,
Hydrabad

Shri K.V. Sehnoi,
Senior Assistant Director of Public Instruction,
Bangalore

Shri P.K. Chidambaram,
Lecturer in Physics,
Tagore Arts College,
Pondicherry

Shri R.K. Shanumugham,
Principal,
Government Basic Training College,
Orthatnaned (Madras)

Member Secretary

Dr. R.N. Rai,
Head of the Department of Science Education,
National Council of Educational Research
and Training,
Delhi

DEHRADUN

Chairman

Prof. N.R. Dhar,
Director,
Sheila Dhar Institute of Soil Science,
Allahabad (U.P.)

Members

Prof. P. N. Sharma,
Prof. of Physics,
Lucknow University,
Lucknow (U.P.)

Shri K.N. Kakkar,
District Inspector of Schools,
Saharanpur (U.P.)

Shri Rajendra Singh,
Principal,
Government College,
Solan (H.P.)

Shri V.P, Bansal,
Science Co-ordinator,
Jullundur (Punjab)

Member Secretary

Shri N.K. Sanyal,
Field Adviser,
Department of Science Education,
National Council of Educational
Research and Training,
Delhi

AHMEDABAD

Chairman

Prof. J.J. Chinoy,
Prof. of Botany and Director
of school of Sciences,
Gujrat University,
Ahmedabad (Gujrat)

Members

Dr. K.G. Desai,
Deputy Director,
State Education Department,
Gujrat, Ahmedabad

Prof. R.C. Mehrotra,
Professor of Chemistry,
Rajasthan University,
Jaipur (Rajasthan)

Shri P.S. Kapoor,
Science Consultant,
Office of the Director of
Public Instruction,
Madhya Pradesh, Bhopal

Member Secretary

Dr. K.N. Saxena,
Field Adviser,
Department of Science Education,
National Council of Educational
Research and Training,
Delhi

CALCUTTA

Chairman

Prof. B.D. Nagchaudhuri,
Director,
Saha Institute of Nuclear Physics,
Calcutta-9

Members

Prof. J.L. Bhaduri,
Prof. of Zoology,
Calcutta University,
Calcutta

Shri P.C. Mukherji,
Director of Public Instruction,
West Bengal,
Calcutta

Shri G.P. Dube,
Additional Director of Public
Instruction,
Bihar, Patna

Prof. M.K. Rout,
Prof. of Chemistry,
Ravenshaw College,
Cuttack

Member Secretary

Dr. M.C. Pant,
Deputy Director,
Department of Science Education,
National Council of Educational
Research and Training,
Delhi

GAUHATI

Chairman

Dr. H.J. Taylor,
Vice-Chancellor,
Gauhati University,
Gauhati

Members

Prof. H.K. Baruah,
Prof. of Botany,
Gauhati University,
Gauhati

Shri P.K. Chaudhri,
Planning Officer,
Office of the Director of
Public Instruction,
Assam, Shillong

Shri H.M. Sharma,
Under Secretary,
Government of Manipur,
Imphal

Prof. A.K. Bhattacharji,
Senior Lecturer,
Department of Chemistry,
M.B.B. College,
Tripura,
Agartala

Member Secretary

Dr. M.C. Pant,
Deputy Director,
Department of Science Ecucation,
National Council of Educational
Reserarch and Training,
Delhi.

All the Chairmen of the five Boards were invited to Delhi Board in order to formulate criteria of selection and common standard of judgement to be followed at different Interview Centres. The Central Board was presided over by Dr. D.S. Kothari, Chairman, University Grants Commission, New Delhi. The following break-up was adopted to make the interview more reliable :

(*a*) Scientific attitude	10 marks
(*b*) Problem solving ability	10 marks
(*c*) Creative thinking	10 marks
(*d*) Scientific Interest	5 marks
(*e*) Self Confidence	5 marks
(*f*) Verbal fluency and comprehension	5 marks
(*g*) Information on current scientific topics	20 marks
TOTAL	65 Marks

While awarding marks, the performance of each candidate acccording to the abovestated framework was kept in mind as far as possible. It may be pointed out that all the members on the boards were either eminent scientists, experts in science, or teachers of science. The representatives of the various State Governments had also background in science.

The following table indicates the States and Territories represented at each of the six interview boards:—

Sr. No.	*Venue of the Board*	*State/Territory represented*
1.	Delhi	Delhi, Rajasthan
2.	Ahmedabad	Gujrat, Maharashtra, Madhya Pradesh
3.	Bangalore	Andhra Pradesh, Madras, Mysore, Pondicherry and Goa
4.	Dehra Dun	Uttar Pradesh, Panjab and Himachal Pradesh
5.	Calcutta	West Bengal, Orissa and Bihar
6.	Gauhati	Assam, Manipur and Tripura

The allocation of the States and Territories to the various interview boards was arranged according to the administrative facilities and the number of contestants from the nearby areas. The analysis of central tendency and variability of scores, interview boardwise, (which is given in Appendix No. X) reveals some very interesting facts. The Interboard variation is often big enough to warrant the attention of the research workers.

3

SELECTION RESULT

3.1. THE MERIT LIST

The entire list of 354 candidates selected under the 1964 Scheme is enclosed in Appendix No. VII. On a close perusal of this list it will be evident that out of the top 25 ranks, 10 ranks have been obtained by the students of Delhi Territory. From the States of West Bengal and Uttar Pradesh, there are 3 candidates each while from the States of Maharashtra, Madras, Panjab and Madhya Pradesh there are two candidates from each State. From the State of Mysore, there is only one candidate out of the total of 25. It will be interesting to note that out of the top 100 awardees for scholarship, 63% have joined B.Sc. course in basic sciences, 28% have joined engineering and medical courses and 9% are either under-aged or not eligible or no reply has been received from them. Out of the total of 354 candidates, 64.97% have joined B.Sc. course in basic sciences while 24.86% have joined either medical or engineering courses.

3.2. VALUE OF SCHOLARSHIP

The value of the scholarship in the successive years of education are as follows:

Rs. 50/- per month in the first year.

Rs. 75/- per month in the second and third years.

In addition to the scholarship amount, the awardees are also given a book grant of Rs. 100/- per annum for 3 years. The scholarship is subject to the condition that the awardee joins B.Sc. course in basic sciences.

3.3. FOLLOWUP OF AWARDEES

Under this Programme, it is intended to prepare cumulative records of awardees who join B.Sc. course in basic sciences to keep track of their academic progress and to offer them guidance, whenever required. This cumulative record will incorporate bio-data, academic record and personality traits. It will also indicate the academic advancement achieved by the awardees as a result of college education. In the preparation of these cumulative records, the help of science teachers, the principals and the parents will be obtained. The next item as a part of the follow-up programme is the organisation of workshops, seminars and summer institutes for the talented scholars in which they will be brought in closer contact with the University teachers of science and with the eminent scientists of the country. It is hoped that with the intensive follow-up programme, it will be possible to produce an accelerated programme of education for the talented scholars in due course. It will also help to keep track of the academic and extramural activities of the awardees so that necessary guidance may be provided to them at regular intervals. The table at Appendix XI indicates the predictive validity of the Science Talent Search Examination of 1963. The overall result is that the Science Talent Search scores have a correlation of 0.65 with the B.Sc. Part I examination marks.

3.4. PROPOSALS FOR THE EXPANSION OF THE SCHEME

It has been possible now to formulate some research programmes on the basis of the data available this year on the various variables. Some of these research programmes are included in Appendix XII. Efforts are being made to improve this Scheme constantly by undertaking research projects alongside other administrative and functional work of this Scheme. One interesting study that has been incorporated in this report is the administration of three psychological tests (Abstract Reasoning Test of D.A.T., Bennett Mechanical Comprehension Test and Minnesota Paper Form Board Test) to the students who were called for interview at six different centres in India. The correlations between the scores on these tests and those on Science Talent Search have been worked out and reported in Table Nos. 1 to 10 of Appendix No. XVII. Correlations between various variables such as personality traits, teachers' ratings, extramural activities etc. have been worked out and are contained in the same Appendix. It will be noted that some of these figures do not indicate very significant results while the others do yield very conclusive ones. This effort has been made to conduct a scientific investigation into the various objective and subjective aspects involved in the evaluation process under this Scheme. The empirical and the predictive validity of the tests have also been worked out and they are reported in Tables 20 to 27 of Appendix No. XVII.

4

ACCELERATED PROGRAMME FOR THE AWARDEES

4.1. EDUCATION OF THE PROMISING AND BRIGHT CHILDREN

It is true that education of the bright and promising children has a long historical background. There is no doubt that academically bright children (like the awardees of Science Talent Search) do display a higher level of mental sagacity and scientific awareness. They need some individual attention from the teachers so that their higher capabilities may not dwindle into the limbo of oblivion while adjusting to the mediocre or the slow learner in a typical scholastic situation. It is interesting to note that according to a newspaper report (Chicago Sun Times, Friday September 23, 1955), President Henry of the University of Illinois, after pointing to the "gross-under-utilization" of some of the nation's highest talent stated:

> "Of 22,50,000 young people who reach the age of 18 each year, 1,52,000...7 per cent...have a rating of ablility higher than that of the average college graduate... . Only a little more than half of them enter college, and fewer than half finish. Two per cent receive doctor's degrees".

4.2. THE PIVOT

Reasoning on identical lines as those given above will lead us to a very relevant point, which is the main pivot of the Science Talent Search Scheme in our country, viz., we have to spot out potentially gifted future scientists for our growing country and for adequate National Reconstruction. We cannot neglect our promising and bright children any more. We have to identify them and give them educational atmosphere which will cater to their growing talents. It is also certain that the secondary school courses, specially in science and mathematics are not adequate in content to challenge the superior child. An empirical analysis will show that most of the content part is devoted to rote memory and ritual experimentation rather than promoting powers of critical thinking, scientific curiosity, creativity or reasoning.

4.3. POSSIBLE SOLUTIONS

One way to achieve the goal is to enrich the curriculum for the bright and arrange some form of individual attention from the teachers. This will help the academically bright to study effectively and rewardingly without being handicapped at the altar of the slow learner or the mediocre.

Another way out is to organize special classes for the gifted. This may be done out of school hours.

The third is to keep the gifted children segregated from the bulk for at least one fourth to one half of the time in a day. This will allow them to concentrate more on research and allied projects and will give them an opportunity to develop efficiency, mental alertness and skills, which cannot be developed along traditional lines of teaching and learning situations. This partial segregation method will give pupils enough freedom to explore and to experiment in academic areas, in which they are specially interested. This individual work will develop in the bright children an ability to think independently and to examine situations critically. This will entail some extra work for the teachers by understanding 'the psychology of gifted children' and 'how to provide challenging opportunities to these students'.

The fourth alternative can be separate schools for the gifted. This particularly, may not be suitable for an ideal democratic country like India because it will entail a lot of expenditure and there will always be a danger of making the academically talented students swollen headed or self conceited by giving them a special treatment. This will also rake up a very important issue, viz., how to get ideal laboratories and ideal teachers for these special schools.

The best solution therefore is that special academic courses and workshop practice be provided to these bright children during long vacations and autumn and winter breaks. There may be widespread workshops and summer institutes, where the bright can come in closer contact with teachers of science from universities and centres of higher learning and the professional scientists. This will also help them to develop individual intellectual qualities. Segregation of talented scholars in special schools does not appear to be a good solution. What is best is to give an accelerated programme of education under the prevailing set up. This is enough to keep pace with the creativity, intellectual stimulation, powers of reasoning and critical judgement of the talented scholars. It will also provide opportunity for diverting intellectual potentials into fruitful and socially acceptable channels.

4.4. THE FOLLOW UP OF THE ACCELERATED PROGRAMME

The follow up of workshops, seminars and summer institutes for talented scholars is of vital importance. One such workshop was organised for Science Talent Search scholars during October 1963 and five workshops will be organised during December 1964.

5

PARALLEL SCHEMES IN INDIA AND ABROAD

The following major parallel schemes need a mention :

(A) Science Talent Search—U.S.A.

(B) National Merit Scholarship Program—U.S.A.

(C) Jagadis Bose National Science Talent Search—West Bengal.

(D) Scientific Olympics—U.S.S.R., Poland and Hungry.

(E) British Association Competitions-United Kingdom.

5.1. (A) SCIENCE TALENT SEARCH—U.S.A.

Many students in junior high school and the early years of senior high school look forward to and prepare for entering the Science Talent Search for the Westinghouse Science Scholarships and Awards when they reach their senior year of high school. This competition discovers, with essential educational co-operation, the youth of America whose scientific skill, talent and ability indicate potential creative originality. Science Clubs and Science Fair activities have proved to be excellent preparation and background for success in their scholarship competition.

The Science Talent Search is conducted annually by Science Clubs of America as an activity of Science Services in cooperation with the Westinghouse Educational Foundation. It is open to any boy or girl who is in his last year in an accredited secondary school (public, private, parochial) in the United States, but excluding U.S. possessions, who is expected by the certifying school official to complete college entrance qualifications before October 1, and who has not competed in any previous Science Talent Search, is eligible to enter this competition.

Each year an Honors Group of approximately 10% of the fully qualified entrants is chosen for special recognition. Members of the Honors Group receive certificates and recommendations to the colleges and universities of their choice. These recommendations usually result in acceptance of the students for admission as well as scholarships and other financial assistance offered by colleges and universities, seeking students of unusual promise in science.

From the Honors Group, the 40 winners of the Science Talent Search are chosen. These winners are invited to attend the Science Talent Institute held for five days each spring in Washington, D.C., with all arranged expenses paid. During the Institute they are judged for five scholarships of $6,500, $6,000, $5,000, $4,000 and $3,000, and 35 Awards of $250 each.

Each winner receives a Science Talent Search Plaque to be presented to the permanent honor and trophy collection of the winner's school.

Each member of the Honors Group receives a Science Talent Search Certificate signifying the honor. The certificate, suitable for framing, is sent to the school for presentation to the student. It becomes his or her property.

Committees of judges, designed by Science Service, judge the contest and the decision of these judges is final in all cases.

A scholarship may be applied towards a course in science or engineering at a college or university chosen by the winner and approved by a scholarship committee named by Science Service. Science and engineering courses must be within the fields of activity of the National Academy of Sciences and the National Research Council. If a scholarship winner withdraws from college, or if the scholarship committee disapproves further use of the scholarship because of reports from the college of unsatisfactory progress, any further benefits from the scholarship are forfeited.

ENTERING THE SCIENCE TALENT SEARCH

To enter the Science Talent Search the senior takes the science aptitude examination in his own school under the supervision of his sponsor, teacher of other authorized school official. Such persons also verify the personal data form submitted by the student and see that the scholastic record is transmitted. The student writes a report of about 1,000 words on his science project. This involves original work. Entrants develop a project that is planned for the Search or adapt to the Search something they already are doing.

Science teachers and school officials, qualified to administer the examination, may, request entry materials for any number of eligible students. Entry materials are mailed from Washington in November. The examinations must be administered early in December.

All entries in the Annual Science Talent Search must reach headquarters of Science Clubs of America in Washington, D.C., by the end of December.

Girls as well as boys are encouraged to enter the Science Talent Search. The number of girls chosen for honor is determined by the proportion of girls who complete entries.

'SEARCH WINNERS' SUCCEED

One of the most frequent questions asked is, "Do Science Talent Search winners really become successful scientists ?"

All the winners have attended or are attending college. With rare exceptions they proceed to bachelors' and about 50% of those who have had time have doctors' degrees. The education of these winners has been supported liberally by scholarships and fellowships. Advanced study in fellowships takes many of them abroad.

Membership in such honorary fraternities as Tau Beta Pi, Phi Beta Kappa and Sigma Xi is so frequent as to be almost standard.

Publication of their work in various scientific journals increases as they proceed with education and research.

Almost every known science has at least one winner specialist. Physics has attracted the largest number. A very small minority have chosen non-science fields for their careers.

The largest group prefers academic research and teaching. As professors, they often have more recent winners in their classes or working as their research assistants.

The second largest number, now working full time, is in industry. Research is the most frequent assignment but a few are in sales, production or administration.

Offers of summer employment in research laboratories come to many of the 40 as soon as they are named winners.

Almost all earlier winners have served in the armed forces but later ones, in general, have been deferred until their education is completed.

Most of the older winners are married and many have four or five children. Science Talent Search women tend to marry scientists and engineers of comparable training or more. The men do not so frequently choose mates in those fields but all have college-trained wives, frequently with degrees to match their own.

All women have worked before marriage; many afterward. Those retired to care for their children express the desire to resume careers later.

Meanwhile they keep up their science themselves and through their husbands' work.

By entering the National Science Talent Search, students automatically enter a state search, if one is held in their state at the close of the national competition.

SCIENCE TALENT SEARCH AIDS

Back issues of Science Talent Search science aptitude examinations and answers are available as long as the supply lasts. One has to specify the year desired. The price is 15c per copy, answers and passing scores included.

One has to send 50c to cover postage and packing of a bundle of four different past Science Talent Search booklets containing abstracts of winners', papers and other information.

5.2. (B) THE NATIONAL MERIT SCHOLARSHIP PROGRAM, U.S.A.

The National Merit Scholarship Program is a nationwide search for students who demonstrate extraordinary ability to benefit from a college education. This annual program is conducted by the National Merit Scholarship Corporation, an independent, non-profit organisation established in 1955.

During the first seven years, NMSC and sponsors have contributed direct financial assistance to nearly six thousand students and their colleges. Additional thousands of students have been helped to secure financial aid from other sources as a result of NMSC activities and services. Merit Scholarships are sponsored by business and industrial firms, foundations, professional groups, unions, individuals, and by NMSC itself.

The number of scholarships awarded in any year depends on the extent of sponsor participation in the program. The number of scholarships awarded in 1962 was 1050. The basic continuing program provides support for scholarships at the level of at least one million dollars a year for fifteen annual programs. In addition, sponsor participation during 1963 provided nearly three million dollars more in sponsored Merit Scholarships.

Participants in the Merit competition are not only considered for Merit Scholarships offered by NMSC and sponsors, but they are also frequently considered for special scholarships awarded by private organisations through the facilities of NMSC. Further, many colleges and universities use the National Merit Scholarship Qualifying Test to help them select students who are to receive financial aid.

8807

The names of Semifinalists in the competition are printed in a booklet that is distributed to all colleges and universities and to other sources of scholarship funds. Studies indicate that approximately five thousand of the Semifinalists are awarded a Merit Scholarship or receive an offer of financial assistance from some other source.

THE SPONSORED MERIT SCHOLARSHIP PROGRAMS

Each year Merit Scholarships are offered by business corporations, foundations, professional organisations, unions, and individuals. Some of these Merit Scholarships have special criteria of particular interest to the sponsoring organisation and of special appeal to certain of the very able students. All Merit Scholars, without exception, are chosen from among the students who qualify as Finalists in the Merit Program.

These widely diversified programs, plus the National Merit Scholarships (supported by the funds of NMSC), make the Merit Program the largest privately sponsored scholarships program in the history of American education; and they make it possible for a student of top-flight ability, no matter what his background, financial position, college choice, or career intent, to win a Merit Scholarship.

The actual number of Merit Scholarships offered in each of the annual selection programs is not known until near the end of the selection period. It depends in part upon the extent of participation by business corporations and other sponsors.

On the following pages are listed some of the organisations which participated either in the seventh annual selection program (for students entering college in the fall of 1962) or in the eighth annual selection program (for students entering college in the fall of 1963), or in both. Many of these programs were again offered in the ninth annual selection program, but inclusion of a program listing did not commit the sponsors to offering Merit Scholarships in the 1962-63 or 1963-64 Merit Programs.

CURRENTLY SPONSORED PROGRAMS

FMC—Foundation Merit Scholarships

4 Scholarships, for boys planning to study physics, chemistry, botany, entomology, biology, zoology, geology, mathematics or engineering.

General Dynamics Corporation Merit Scholarships

12 Scholarships. Restricted to sons and daughters of General

Dynamics'—employees who have completed two years of service. Children of retired and deceased employees are eligible.

General Foods Fund Merit Scholarships

6 Four-year scholarships. For study in the liberal arts or sciences for which a bachelor of arts or bachelor of science degree is awarded.

Charles F. Kettering Foundation Merit Scholarships

5 Scholarships (1962). For students who plan to major in the natural and physical sciences.

Kimberly-Clark Merit Scholarships

2 Scholarships (1962-63). Sponsored by Kimberly-Clark Foundation. No restrictions as to course of study.

Ling-Temco-Vought Merit Scholarships

3 Scholarships. For sons of employees of Ling-Tenco-Vought, Inc., its divisions and subsidiaries. Restricted to Finalists who will study engineering, one of the natural sciences or mathematics.

Mead Corporation Merit Scholarships

2 Scholarships. For boys planning careers in accounting, business or personnel administration, chemistry, physics, or engineering. One for an employee's son qualifying for merit scholarships; one for a resident of any of the states in which the company has plants.

Santa Fe Merit Scholarships

5 Scholarships. For children and grandchildren of employees of Santa Fe Railway system and its wholly owned affiliated companies who qualify for Merit Scholarships; or for residents of states served by the system. The Santa Fe also offers a special group of scholarships for students of American Indian decent who attend schools in states served by the Sant Fe. Such students should also take the National Merit Scholarship Qualifying Test and request their principals to notify NMSC of their special eligibility for these scholarships.

Shell Merit Scholarships, sported by Shell Componies Foundation, Inc.

25 scholarships. For students intending to pursue high school teaching careers in mathematics, chemistry, physics or general-

science. The Shell Foundation also supports a fifth year of college training at Cornel and Stanford universities for Shell Merit Scholars who need and desire it in further developing their plans for high school teaching in these fields, with payment of tutition and fees, stipends of from $1800 to $2100, and grants to the participating universities.

Signode Foundation Merit Scholarships

1 Scholarship. For a student who intends to prepare for a career in teaching or science, with preference given to children of employees of the Signode Steel Strapping Company who qualify in the Merit Program, regardless of course of study.

The Singer Company Merit Scholarships

For all children of employees of the Singer Manufacturing Company and its wholly owned subsidiaries, plus 5 scholarships for girls, not employees' children, planning to team home economics in college or high school.

Standard Oil Foundation Merit Scholarships

10 Scholarships. For children of employees or annuitants of Standard Oil Company (Indiana) and its subsidiaries. No restrictions as to accredited college or course of study.

Stone and Webster Merit Scholarships

2 scholarships. Limited to children of employees of the Stone and Webster Organisation who qualify for Merit Scholarships. There are no restrictions as to the college or course of study.

Titmus Optical Company Merit Scholarships

1. scholarship: For a student planning a career in optometry. Beginning in 1957-58, Titmus Optical Company, Inc., has sponsored one new student each year.

United States Air Force Merit Scholarships

30 Scholarships. Limited to children of Air Force military members who are on active duty at the time the scholarships is granted. No restrictions on field of study. Financed by Air Force Central Welfare nonappropriated funds. In addition, a limited number of educational assistance loans are made available for qualified dependent children.

U.S. Career Merit Scholarships

5 Scholarships. Awarded by the Edgar Stern Family Fund. For Finalists who indicate the intention of entering government service. Winners may attend any college and pursue any course of studies appropriate for them.

Upjohn Company Merit Scholarships

14 Scholarships (1962-63). Primarily for students majoring in chemistry, biology, engineering, pharmacy, or premedicine. Includes one or more scholarships at both Kalamazoo College and Western Michigan University for science students. Two scholarships are unrestricted.

The Webtex Merit Scholarship

1 Scholarship. No restrictions except that of high financial need.

The Western Publishing Company Foundation Merit Scholarship

6 Scholarships. No restrictions as to study at any accredited college or university. The selections will be limited to applicants from Racine County, Wisconsin, and Dutchess County, New York.

Weyerhaeuser Company Foundation Merit Scholarships

Unlimited number of scholarships for children of employees of Weyerhaeuser Company and its subsidiaries; if none qualifies as a Finalist, one scholarship will be awarded to a boy majoring in forestry.

Wood Conversion Foundation Merit Scholarships

2 Scholarships awarded annually to the children of employees who have two years of service with the Wood Conversion Company or its subsidiaries. No restrictions on choice of accredited college or course of study.

F.W. Woolworth Co. Merit Scholarships

5 Scholarships. An award will be made in each of five geographic sections of the country. Scholars must pursue a course of study leading to a degree of bachelor of arts or bachelor of science.

World Book Year Book Merit Scholarships

20 or more scholarships. Reserved for students who are relatives of qualified Field Enterprises Educational Corporation sales representatives or managers.

OBJECTIVES AND PARTICIPANTS

Operational objectives of the Merit Program

The National Merit Scholarship Program has three operational objectives: To discover exceptionally talented young people, and to encourage them to obtain a college education.

To work with corporations, foundations, other organisations, and individuals in establishing scholarship programs that utilize the services available through the Merit Program.

To conduct research related to the foregoing and to publish the results for the information of educators and the public.

The Merit Program has grown steadily since it was initiated in 1955. Today it is the largest independently supported scholarship program in the history of American education.

More than 15,000 high schools, enrolling about 90 per cent of the nation's high school students, now participate in the Merit Program. More than 130 sponsors currently are awarding Merit Scholarships in addition to the scholarships awarded by the National Merit Scholarship Corporation.

Nearly 5000 students received Merit Scholarships during one year. Approximately 3300 of them were enrolled in almost 400 colleges and universities throughout the country in 1961-62. Of the graduates, about 75 per cent were enrolled in graduate or professional schools, and eight out of every ten received a fellowship or assistantship.

The total value of the awards made thus far—that is, money spent or committed by NMSC and sponsors in awards to students and grants to their colleges—is nearly $ 25 million. In addition, each year, through the Merit Program's special services, thousands of other highly able students are assisted in obtaining financial aid from other sources.

PARTICIPATING GROUPS

The Merit Program is made possible through the co-operation of countless individuals in secondary schools, colleges and universities, business corporations and foundations, labour unions, and educational, professional and business associations.

Particularly helpful in bringing about improvements in the program has been the guidance provided by four groups. These are the Board of Directors, composed of businessmen and college and secondary school officials; the Advisory Council, made up principally of persons from secondary schools and educational associations; the Research Advisory Board, a group of authorities particularly interested in studies related to the talented and the National Merit Scholarship Selection Committee, experts in the fields of college admissions and financial aid.

FINANCING AND POLICYMAKING

How the Merit Program is Financed:

The National Merit Scholarship Corporatian (NMSC) is a non-profit organisation. It was established in 1955 through a $ 20 million grant from the Ford Foundation and a $ 500,000 grant from the Carnegie Corporation of New York.

The Ford Foundation grant provided $ 1 million a year in scholarship funds for ten annual selections of Merit Scholarships, $ 2 million for administrative costs, and $ 8 million in dollar-for-dollar matching funds to encourage others to become scholarship sponsors. The Carnegie Corporation grant also was for administrative expenses during the first five years of the program.

Because the program's administrative costs are defrayed through the founding grants, a scholarship sponsor's costs are limited to awards to students and associated grants to the colleges they attend. Such expenditures therefore are fully effective as an aid-to-education program, and this has been an important consideration to scholarship sponsors.

Merit Scholarships financed through the Ford Foundation grant are known as National Merit Scholarships, as are some sponsored scholarships whose sponsors wish to remain anonymous. Merit Scholarships provided by business corporations, foundations, unions, professional associations, and individuals usually bear the name of the sponsor—for example, Sears Foundation Merit Scholarships. The Honorary Merit Scholarships involve no financial commitments.

As of the sixth annual selection, made in 1961 for Scholars entering college in the fall of that year, a total of 2438 students have received National Merit Scholarships and 2456 had received sponsored Merit Scholarships.

The amount of money expended or committed by the National Merit Scholarship Corporation in awards to scholars and grants to their colleges was $ 12,195,000 and the amount expended or commmitted by sponsors was $ 12,290,000. Since awards to Scholars and grants to colleges are variable, these figures, are based on an estimated average total cost of $ 5000 per scholarship. A financial statement is published each year in the Annual Report.

NMSC's research, begun in the first year of the Merit Program, was instituted through grants from the Old Dominion Foundation and the National Science Foundation. NMSC also contributes financial support to the research program out of that portion of its resources designated for administrative purposes. In 1961 the Carnegie Corporation made an additional grant to NMSC to be used for research.

The costs of the qualifying test are defrayed through a $ 1 fee paid by each student to the testing agency. This fee also covers the costs of reporting the scores to the schools and the students and of providing them with interpretation materials used for guidance and counseling. If an outstanding student is unable to pay the fee, NMSC pays it for him. NMSC does not receive any income from the testing operations.

All other expenses—the costs of obtaining additional data about Semifinalists, the selection process itself, the administration of NMSC's and the sponsors' individual scholarship programs, various special liaison with schools, colleges and sponsors, public information, and the like—are met through the funds earmarked for such purposes in the founding grants.

How Policies are Determined

Prior to the creation of the National Merit Scholarship Corporation, many educational and business leaders were consulted. It was their suggestions that established the initial policies of the Merit Program while providing mechanisms that would help to keep it a dynamic one, adaptable to changing circumstances and new needs and opportunities.

Policies now are determined by a Board of Directors, the membership of which is drawn from the fields of secondary education, higher education, business and industry. The term of membership on the Board is three-years, with re-election possible. Except for the president of NMSC, who also is a director, the directors receive no salary, fee or honorarium.

An Advisory Council gives consideration to the effects of the Merit Program on the educational system of the nation, and makes recommendations for improving the program. This Council is composed entirely of persons in the educational field.

Some of the most important changes in the program have resulted from recommendations by individual principals and counselors whose schools participate in the program. Each suggestion receives careful consideration at NMSC and every matter of general significance is brought to the attention of the Advisory Council. The council's recommendations have been followed in every instance.

In the area of research, a Research Advisory Board performs functions similar to those of the Advisory Council. Finally, the Selection Committee, which chooses the National Merit Scholars and the recepients of certain sponsored Merit Scholarships, also informally provides advice on the selection process.

5.3 (C) JAGADIS BOSE NATIONAL SCIENCE TALENT SEARCH, WEST BENGAL—NATURE OF THE SCHEME

The Jagadis Bose National Science Talent Search (JB-NSTS) Scheme, one of the long-range Acharya Jagadis Chandra Bose Centenary schemes to perpetuate the memory of the great scientist, was sponsored in 1958 by Sir Jehangir Ghandy, one of the vice-presidents of the Centenary Committee. The main object of the scheme is to spot, with the effective assistance of educational institutions, boys and girls with special aptitude and intelligence for scientific work from college students of certain categories indicated later. Through suitable tests, every year, not more than 10 candidates are selected for the award of scholarships.

Apart from the discovery and sustenance of scientific and technological talent in our youth, it is hoped that the scheme will be able to increase to a degree the public awareness to the varied and vital role that science and technology are coming to play in our country today.

The nature of the scheme will be more clearly understood if attention is drawn to the Westinghouse Science Talent Search scheme in the U.S.A. on which it is largely modelled. The Westinghouse scheme, inaugurated in 1942, aims to keep up the flow of scientists and engineers needed to improve and maintain the American civilisation which is vitally dependent on science and technology. Essential co-operation is rendered by educational institutions to make the scheme the great success that it is.

CONDITIONS OF ELIGIBILITY

1. Any boy or girl reading in a college affiliated to any of the universities in West Bengal may apply for the competition provided that he or she has passed:

(a) the higher secondary examination with science group subjects and is reading in the first year of the three year science degree course,

or

(b) The School Final Examination with elective science subjects and completed the first year course in a college with science subjects and is reading in the second year I.Sc. class or completed the preuniversity course and is reading in the first year of three-year science degree course, or

(c) The Senior Cambridge Examination with science stream subjects and is reading in the second year I. Sc. class or in the first year of the three-year degree course.

CRITERIA OF ELIGIBILITY

2. The minimum qualifying marks for eligibility are as follows:

(i) Sixty per cent in elective science subjects in the higher secondary examination, or

(ii) Sixty per cent in compulsory and elective science subjects in the School Final Examination as also in science subjects in periodical and/or annual examination in college.

OTHER PARTICULARS

(a) Age: There is no age limit in this competition.

(b) Expense: No fees will be charged for this competition.

(c) Time Limit: No candidate can compete more than once.

(d) The financial condition of the contestants (or their parents) will not be taken into consideration for making the award. A recipient of the JB-NSTS award may enjoy other scholarships also.

HOW TO APPLY?

Candidates will have to fill in a form (Form No. 1-Personal Data) giving particulars of their attainment etc. Another form (Form No. 2) will be filled in by the Principal/Headmaster/Headmistress or a science teacher of a college or a school countersigned by the Head of the Institution as the case may be (this may be treated as a confidential document).

MODE OF SELECITON

Selection of candidates from among the applicants will be done by a committee of the JB-NSTS. The selection will be primarily based on the information supplied in both these forms. Only the selected candidates will be allowed to sit for the two written tests.

WRITTEN TESTS

The two written tests, each of 2 hours' duration, are conducted in *English*; one is a knowledge and aptitude examination on the principal basic science subjects—mathematics physics, chemistry, botany, physiology, zoology, geography and geology and the other is an Essay Paper on some scientific topic.

The selected candidates are required to sit for the examination at the nearest centre to be opened, depending upon the number of students from the area and also upon the co-operation of the authorities of schools and colleges who may be willing to open such centres and help in the conduct of the examination.

SCHOLARSHIPS

Scholarships, valued at Rs. 75/- per month, are awarded to the best candidates as finally adjudged. The scholarships are tenable for three years and may be extended to a further period of two years during which period the amount may be increased to about Rs. 150/-. In case any recipient fails to make satisfactory progress, the scholarship is discontinued. The details of terms and conditions of the payment are decided by the Governing Board of JB-NSTS.

All decisions of the Governing Board are final.

Note:—The first year's competion was held in December, 1960.

5.4 (D) SCIENCE OLYMPICS

Scientific Olympics are a feature of the academic life of the U.S.S.R., Poland, Hungary and other countries. In Hungary, the Eotvos competitions began as early as 1894, and it is reported that many brilliant young mathematicians made their mark first at those competitions. The special features of the Science Olympics are :

(*a*) the openness of the competition, and the chance it offers to youngmen of genius, with or without a University distinction, to prove their mettle in the particular science of their choice ;

(*b*) the unconventional nature of the examination itself, which is set by distinguished men of science, and which is intended to uncover the originality of the examiners rather than to confirm their competence ; and

(*c*) the principle of elimination of all but the best, by successive rounds of regional examinations. It is this principle which underlies the name 'Olympics'.

PROPOSED SCHEME REGARDING OPENING OF SCIENCE OLYMPICS IN INDIA

The Government of India is intending to hold Science Olympics in

Physics and Mathematics. The Olympics will be held in three stages, *viz.*, (i) District Olympics, (ii) State Olympics and (iii) National Olympics. Scholarships will be awarded to meritorious students. This Scheme will be applicable to the youngmen to the age group 18-25.

5.5 (E) BRITISH ASSOCIATION COMPETITIONS (UNITED KINGDOM)

The British Association in collaboration with industrial establishments like the I.C.I. holds competitions to stimulate interest in scientific writings. The Association also organises exhibitions which include models prepared by students and made out of simple components, chemical and biological exhibits and specimens collected by field workers. The B.B.C. and the Television authorities have continuing programmes for the benefit of the school children. Eminent scientists from all over the world are invited to deliver "Junior Presidential Addresses" for the benefit of young students. In U.K. the scientific societies in educational institutions are well-maintained and support a wide range of interests.

The Royal Society in London is an important organisation for the dissemination of knowledge and the weekly lectures arranged by the society cover the whole range of science. Juvenile lectures are collected, printed and distributed to schools and colleges.

Thus fostering of talents in U.K. is a continuous process.

6

INTERPRETATION OF THE DATA

6.1 Areawise Distribution of Items on Science Aptitude Test

On a perusal of the Appendix V, it will be clear that the number of items asked in Physics and Chemistry Sections were equal and the weightage to these was the highest amongst the 14 branches of sciences included in the test. Next comes the weightage to Biology followed by Mathematics and in the rest of the 9 areas the number of items was equal, *viz.*, 10. In Bio-physics, Bio-chemistry and History and Philosophy of Science, there were no factual type items because in these branches there is no specific syllabus available in any of the Secondary Boards of India. The number of factual and that of thought-type items was equal in the rest of the 11 branches. The low weightage to the areas of Meteorology, Astronomy, Physiology and Hygiene, Engineering and Agriculture is because these areas are not included in the curriculum of the Secondary Boards. The number of thought-type items has been increased this year as compared to those of last year because it is felt that these are the very type of items which discriminate the high achievers from the low achievers. A glance at the table of Appendix 13 will make it clear that 79% of the thought-type items and 48% of the factual type items were selected on the basis of difficulty and discriminative values.

6.2 Distribution of Thought-Type Items of Science Aptitude Test

Appendix VI enumerates the various Sections together with the number of passages and the number of items culled from those passages under each area. The last column gives the average number of items per passage. There seems to be a wide variation amongst the paper setters in this respect. The number varies from 1.25. to 4.0. On an average, the number of items per passage is 2.5. This variation may be due to many reasons, like the readabilitiy of the passages from different subject areas, abstract nature of the subject matter etc. This may also be due to the fact that there are some areas where culling of items (which can judge critical thinking and scientific reasoning together with the use of higher mental powers) is very difficult and hence the average number of items per passage for such areas is as low as 1.25 and 1.67, *e.g.* in Geology, and in Agriculture.

6.3. ANALYSIS OF THE MERIT LIST

In Appendix VII and VIII is given the analysis of the merit list, taking seven slabs of 50 ranks each (in order of merit) to indicate the educational courses opted by the awardees. Amongst the first 50 students, 35 joined basic sciences, 12 joined engineering and technological courses and none medical. Out of the top twenty awardees, 16 have joined basic science courses, only four have joined Engineering courses and none have joined medical courses. The usual impression that top meritorious students are more likely to go in for engineering, technological or medical courses is not borne out by the present data. *Rather there seems to be a tendency for the brilliant students to opt for basic sciences in preference to the technological or medical courses.* In the next batch of 50 students, 28 have opted for basic science courses, none for medical and 16 for engineering and technological courses. In the last slab of 54 students, 41 students have joined basic sciences, while 2 have joined medical and 7 have joined engineering and technological courses.

Amongst the top 100 students, 63% have gone in for basic science courses while in the middle 100, 59% and in the last group of 100 students 68% have joined basic science courses. 28% of the students in the top group have joined engineering and medical courses. This figure is 27% in the middle band and 24% in the 3rd merit band. There is no marked tendency for top students to go in for technological or medical courses.

On the whole, 64.97% of the students have joined basic science courses while 24.86% of the students have joined medical or engineering courses. This discrepancy may be due to the specific aptitude of children, facilities extended and the pre-conditions laid down by the scholarship scheme as well as the pre-conditions of admission to the various institutions in the country.

6.4. STATEWISE DISTRIBUTION OF THE CONTESTANTS AND THE AWARDEES

It will be evident from Appendix IX that there is a wide variation amongst the states in respect of the number of students taking the Science Talent Search Examination. This simply reflects that :

1. (1) The total number of candidates in class XI in different states is different.
2. (2) Publicity of the Scheme in all the States might not have been uniform. Some States and Union Territories like Delhi, U.P.,

M.P. and Pondicherry have sent an appreciable number of students to take the test.

(3) There may be wide variation amongst States and Territories in the number of students with 55% marks in science subjects in class X (or equivalent).

(4) In some States the facilities for professional courses are quite adequate to accomodate majority of the bright students, leaving very little incentive for them to go in for basic science courses.

In column 5 are given Statewise Selection ratio (in percentage) at the first stage of selection, *viz.*, those eligible for being called for interview on the basis of marks obtained in the theory papers. It will be interesting to note that the selection ratio for the State of Madras and Territories of Delhi, Manipur, Goa, & Pondicherry is high indicating that probably only those students were sent for the tests who were high achievers. In the States of U.P., Rajasthan, M.P. and A.P., the selection ratio is comparatively low indicating that the selected students who appeared at the tests (those having marks 55% and above in science subjects) have probably not been able to show matching ciritical thinking and scientific comperhension as could have been expected on the basis of their academic achievement (as reflected by schoolmarks). This indicates that :

(1) The curricula in these States may not be as comprehensive as is required by the Science Talent Search tests.

(2) The school marks in these States reflect a rote memory knowledge rather than wide spectrum of scientific comprehension based on critical thinking and reasoning.

(3) The teaching in these States may be more oriented to prepare students for examinations demanding rote type of selective learning rather than developing scientific concepts, creativity and critical thinking in them.

(4) The cut-off score of 55% reflects different standards of cognitive abilities in different States and Territories.

A perusal of column 7 giving the final selection ratios, indicates almost the same trend for the different States as was indicated in Column 5. Again we find that Territories and States like Delhi, Goa, Manipur, Madras and Maharashtra show more impressive results than U.P., Rajasthan, Madhya-Pradesh, Bihar and Himachal Pradesh.

The plausible reasons for comparatively good performance from Delhi (in addition to those quoted above) may be that :

(1) Students in Delhi have an advantage over others in having better library and laboratory facilities in addition to better experimental methods of teaching.

(2) There may be some familiarity with objective type tests amongst Delhi students because of the Pilot Project, 1963. (To compensate for this relative disadvantage of the students from other States, the Department of Science Education has sent copies of the 1964 test papers to all the States and Territories so that the teachers and students may get an idea of the type of tests that they can expect.)

(3) Delhi students have facilities of television lessons and having well qualified science teachers.

Column No. 8 indicates the percentage distribution of the awardees in the different States. All the participating States have received a few scholarships, although territory like Delhi has taken a big chunk out of the total number. It may be noted that the awards were made on an All India basis and no State/Territory quota was fixed. However, one feels that from the States like U.P., Bihar and Madhya Pradesh, where the student population is quite large and much more than that in Delhi, a larger percentage could have competed successfully in case their teaching and learning standards were comparable with Delhi and Madras.

6.5. INTERBOARD VARIATIONS IN THE DISTRIBUTION OF SCORES ON THE DIFFERENT SUBTESTS

Appendix X gives the mean and standard deviation of the scores, together with their standard errors, for each of the interview boards. It also gives the frequency distribution of scores boardwise and testwise. The average scores on Science Aptitude Test varies from 57.23 to 70.20 while the pooled mean is 61.72. It is interesting to note that barring Delhi Board, average scores on the rest of the 5 boards are not much different. On the Essay Paper, the average scores on the six boards, excepting that of Ahmedabad, are almost homogeneous. In the distribution of scores of project report, the average for the different regions are again homogeneous.

However in the interview, inter-regional variation is more marked probably because of the heterogeneity of the various interview boards. The average score at Ahmedabad Board is the highest while that at Bangalore is the lowest. Despite the fact that Delhi Board students have done well at the theory tests, they have recorded comparatively lower average score on the interview. This may be because of the more rigorous norms adopted at Delhi Board. Bangalore Board records the lowest average. This may be due to the same reason as explained above. This indicates that effective steps should be taken to structure the interview on sound lines and to increase the reliability of the interview. It seems desirable to re-scale the interview marks on the basis of theory marks. The averages of the aggregate marks are lower for Bangalore, Dehradun and Gauhati, while for Delhi, it is highest and for Calcutta and Ahmedabad they are slightly above the average. It indicates that the overall performance of the students of Delhi Board is superior to those of the other boards.

From Table 1 (Appendix X) it appears that the distribution of Science Aptitude Test Scores is positively skewed in the case of all the Boards.

The distribution of Essay marks (Table 2) is more or less identical in all the Boards. The distribution of scores on project report is on the whole positively skewed.

The distribution of scores on the interview is positively skewed for all the Boards. Most of the scores seem to cluster round the lower class intervals indicating that strict marking was adopted at almost all the places.

Regarding the distribution of composite scores, on the whole, it is positively skewed. The distributions of scores at all the Boards seem to be platykurtic and even bimodal in some cases. This is because the composite scores are the aggregate of scores, having different means and standard-deviations.

6.6. A FOLLOW-UP STUDY OF 1963 AWARDEES, WHO JOINED BASIC SCIENCE COURSES

Appendix XI gives the correlation between the total of the Science Talent Search Examination and Physics, Chemistry, Mathematics and the total marks secured at the B.Sc. Part I examination by the seven students who were awarded scholarship under the Science Talent Search Scheme during 1963.

In view of the following:

(a) very small sample,

(b) unreliability of the essay-type examination in various institutions, and

(c) differences in the educational standards of the various institutions, it may be pointed out that not much reliability can be attached to correlational figures obtained herein. Further follow-up studies are needed to establish the predictive validity of the Science Talent Search tests. It is proposed to do an intensive follow-up study of 1964 awardees to establish predictive validity of the tools of selection.

6.7. FURTHER RESEARCH PROJECTS

In Appendix XII, 20 further studies have been suggested which will be useful in improving the Science Talent Search tools of selection. Some of these projects will be taken up by the Department of Science Education, National Council of Educational Research and Training. It may be necessary to work in collaboration with parallel bodies in India and different countries of the world to chalk out an integrated programme of identifying scientific talents and fostering them.

6.8. ITEM ANALYSIS OF SCIENCE APTITUDE TEST

In order to judge the suitability of the different test items, a detailed item-analysis has been carried out, which is reported in Appendix XIII.

It will be noted that on the basis of the difficulty values and discriminating power of items, (taking a cut-off point at 17 for discriminating power and difficulty level between 24 and 69) 52% of the items of factual type, 21% of thought-type and 34% of the total have been rejected mostly in the areas of Physics, Chemistry, Mathematics and Astronomy. It will be interesting to note that the thought-type items have proved to be more discriminating than the factual type, which indicates that powers of critical thinking, analysis-synthesis and reasoning occupy an important place in the effective teaching and learning of science at the secondary stage. In the subjects like Geology, Physiology and Hygiene, History and Philosophy of Science, Bio-physics and Bio-chemistry, (which are non-curricular subjects) most of the items are discriminating, which indicates that the high achievers have better acquaintance with these new areas also, while the low achievers do not possess it.

Items which are suitable on the basis of discriminating and difficulty values are given below :—

3, 6, 7, 9, 11, 14, 18, 24, 28, 29, 30, 31, 33, 34, 35,
36, 38, 39, 40, 45, 46, 48, 49, 50, 51, 53, 56, 57, 62, 64,
65, 66, 69, 72, 76, 77, 78, 81, 82, 84, 86, 87, 88, 90, 91,
92, 93, 94, 95, 96, 97, 98, 99, 100, 102, 103, 104, 105, 106, 108,
109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123,
124, 125, 126, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 140, 141,
142, 143, 145, 146, 147, 148, 149, 150, 152, 153, 154, 155, 156, 157, 158,
159, (N=106).

6.9. RELIABILITY OF THE SCIENCE APTITUDE TEST

The reliability of the Science Aptitude Test has been worked out by Kuder-Richardson formula (KR-20) (in Appendix XIV) which gives the internal consistency of the test items and thus the dependability of the test scores. The figure is 0.90 which is high and indicates that the test is reliable. This method of rational equivalence stresses the intercorrelations of the items in the test and the correlations of the items with the test as a whole.

6.10. EMPIRICAL AND PREDICTIVE VALIDITY OF THE TEST SCORES

A perusal of Tables 20, 21, 22 and of Appendix XVII will reveal that the correlations between STS Total and high school marks (Science subjects) are not very high. This may be due to the different norms adopted implicitly by the different schools in the country to measure the academic achievements. Besides, the school marks measure primarily the actual achievement (wih imperfect reliability) whereas the STS tests are intended to guage scientific aptitude (with greater reliability) rather than pure achievement. Again the relationship between achievement and aptitude may not be exactly linear as is measured by the product moment correlation coefficient.

A perusal of Tables 24, 25 and 26 of Appendix XVII will reveal that the correlations between STS marks and higher secondary marks (Science subjects) are slightly more pronounced except in mathematics, although these validity figures are low in themselves. The reasons are the same as stated above.

6.11. INTER-CORRELATIONS OF THE SUB-TESTS OF SCIENCE TALENT SEARCH

From the table of inter-correlations of the various sub-tests (Appendix XV), it is interesting to note that these inter-correlations are generally low. The inter-correlations of the various sub-tests being low, it can be concluded that these four different tests are measuring different abilities and are not overlapping each other's domain. These four selection tools can be used as a battery.

It may be pointed out that there is a low and negative correlation between ths Science Aptitude Test and the Essay paper. This is interesting because both being tests of cognitive abilities, are expected to be positively correlated. However, on a closer examination, the possibility of the negative correlation as obtained here, can be explained by assuming that the essay examination is highly saturated with verbal fluency, handwriting and allied factors, which may sometimes inhibit the process of deep thinking and concentration, which are vital for answering the types of questions put in the Science Aptitude Test. However, this correlation though significant, is very low and further factorial studies are needed to establish the relationship between the abilities called into play in responding to an essay examination and to a Science Aptitude Test.

The correlations of the S.T.S. total with the sub-tests are all positive and significant. This is on account of the overlap between the S.T.S. total (which is aggregate of the sub-tests) and the sub-tests.

6.12. CORRELATION BETWEEN S.T.S. SCORES AND INCOME LEVEL OF THE PARENTS OF THE AWARDEES

The correlation between S.T.S. scores and income level as calculated from the selected population works out to be 0.24 (in Appendix XVI). This figure (as it is significant at ·01 level, for 199 degrees of freedom) indicates that the children coming from higher income groups are likely to do better on S.T.S. tests than those coming from comparatively low income groups. One of the plausible reasons may be that students from higher income groups can afford to join better institutions and enjoy facilities that are conducive for the growth of talents.

The median income of the parents of the awardees is approximately Rs. 609/- p. m. which partially supports the views expressed above.

The distribution of the income is given in Appendix XVI. It will be observed that the distribution conforms to the PARETO LAW OF INCOME DISTRIBUTION.

6.13. SOME CORRELATIONAL FIGURES AT A GLANCE

In the Appendix XVII, there are 80 correlations between the following variables:—

(1) S.T.S. aggregate scores
(2) Minnesota Paper From Board Test
(3) Bennett Mechanical Comprehension Test
(4) Abstract Reasoning Test (D.A.T.)
(5) Age
(6) High School marks (Science subjects)
(7) Higher Secondary marks (Science subjects)
(8) Teacher's rating on traits like : initiative, self-confidence, aptitude for science, scientific attitude, inventiveness and laboratory skill
(9) Participation in science activities
(10) Prizes and awards for science activities
(11) Science projects developed
(12) Science literature read
(13) S.T.S. subtests

The inter-correlations of the scores on the three psychological tests and the S.T.S. total are all significant at .01 level and are positive. This indicates that a common factor runs through these three psychological tests and the S.T.S. total. This common factor may be either the abstract reasoning ability or the power of analysis-synthesis. However, a factorial analysis of the composite scores of STS and the three variables given above can reveal whether the structure, as conjuctured above, does hold good or not.

Tables 4, 5, 6 indicate the inter-correlations between the three psychological tests. All the figures are significant at .01 level, indicating a common factor. Tables 7, 8, 9 give the correlation of age with the three psychological tests. In two cases it is not significant while in one case, it shows a low negative correlation, indicating that either the scores on tests are independent of age or the performance decreases with the advancement of age. Table 10 indicates the relationship of age with S.T.S. marks. The figure is again not significant. The same tendency is shown (Tables 11 and 19) when age is correlated against the performance on science subjects at the High and Higher Secondary stages. Thus the general impression that the academic performance improves with advancement of age is not supported by this analysis. It may be noted that some universities and examining bodies have fixed certain threshold age below which the students cannot be permitted to take admission to the first year of a degree course. This is perhaps based on the hypothesis that students below that threshold age are not mature enough to undergo the high level course at the University. *The present study seems to refute this ageold belief. It is high time that the authorities may examine this practice again in the light of the findings to avoid stagnation of talents due to the imposed age restrictions.*

Tables 20 to 22 and 27 give the inter-correlations of S.T.S. tests with high school marks in science subjects. The figures are not significant except in case of Biology, where the correlation is although significant but very low. This may be due to the usual imperfect reliability and validity of essay type examinations prevalent at the school stage. Secondly S.T.S. tests are aptitude tests, while the High and Higher Secondary School examinations are achievement tests.

Tables 24 to 26 give the correlations of S.T.S. total with Physics, Chemistry, Mathematics scores obtained at the Higher Secondary examination. For Physics and Chemistry the correlations are 0.22 and 0.32 respectively. These figures are low but significant at. .01 level. In the case of mathematics the correlation is not significant. These low figures can again be explained on identical lines as stated above.

Tables 23, 28, 29 and 30 give the correlation of scores in science subjects at the high school level with those of the higher secondary level. They, in fact, give the predictive validity of the High School marks. It may be argued that these validity figures are higher than in the case of S.T.S. scores and hence the S.T.S. tests may be discarded in favour of school marks.

It may be observed that the S.T.S. scores are primarily indicators of scientific aptitude and creativity (as against achievement) and hence can be validated against standardised Scientific Aptitude Tests only or against actual contributions of awardees in the scientific and technological fields.

Tables 31 to 60 indicate that there are very low correlations between the teacher's subjective ratings on personality characteristics, *e. g.* selfconfidence, initiative, aptitude for science, inventiveness, laboratory skills, and scientific attitude with S.T.S. subtests and the S.T.S. total. This is partly due to the subjective ratings of the teachers on traits about which they do not have a clear cut judgment. This fact was brought out on personal interviews with a set of science teachers all over the country, who filled up the Report Form of the contestants. Some of these teachers exhibited complete indifference in filling up the blanks. Many teachers indicated that because of the large number of students put under their charge, it was not possible for them to form an independent and clear idea about the personality traits of individual students.

Tables 61 to 65 give the correlations between S.T.S. total scores and science activity, prizes and awards received, level of aspiration, science literature read and individual experimentation. These figures are generally significant, though relationships are not very strong. This indicates that these variables explain only a small part of the variation in the S.T.S. scores and taken singly may not be useful in predicting the individual's S.T.S. scores.

Tables 66 to 80 give the intercorrelations between the personality traits as judged by the teachers. The phi-coefficients are all significant indicating that an individual who has been placed high or low on one personality trait has been placed similarly in respect of other personality traits also. This may be because of the tendency of some of the teachers to form prejudged opinions about students, which are often not based on objective observations with regard to the different traits.

APPENDIX I

A short account of the workshop organised for Science Talent Search students from October 3 to October 12, 1963.

A workshop of 10 days was held at the Tutorial Library Building, Delhi University, to produce an accelerated programme of science education for the awardees of the 1963 pilot project of Science Talent Search. In this workshop, 27 students participated which included the awardees of Science Talent Search and the top ranking position holders from the Merit List of Central Board of Education, Delhi.

The following resource personnel were invited to participate in the workshop:

1. Dr. R.N. Rai, Head of Science Department, N.C.E.R.T. *President*
2. Dr. R. P. Mitra, Professor of Chemistry, Delhi University, Delhi. *Director*
3. Dr. K. N. Saxena, Field Adviser, N.C.E.R.T. *Secretary*
4. Dr. R. C. Mehrotra, Professor of Chemistry, Rajasthan University, Jaipur.
5. Dr. P. C. Vaidya, Professor of Mathematics, Gujrat University, Ahmedabad.
6. Dr. R. N. Singh, Reader in Botany, Banaras Hindu University, Varanasi, U.P.
7. Dr. K. N. Saxena, Reader in Zoology, Delhi University, Delhi.
8. Dr. D. D. Pant, Principal and Prof. of Physics, D.S.B. Degree College, Nainital.

Other invitees were:

1. Prof. G. L. Chandratreya, Principal, Institute of Post-Graduate (Evening Studies), Delhi University, Delhi-6.
2. Gen. W. M. Williams, Scientific Adviser, C.S.I.R., Rafi Marg, New Delhi-1.
3. Dr. N. E. Bingham, Consultant, U.S.A.I.D., New Delhi.

4. Sardar Thakur Singh, Incharge, University Workshop,
   Delhi University, Delhi-6.

On the first three days, the experts stated above, held meetings with other scientists and teachers of science and decided upon the detailed plan of the workshop. It was decided that alongside some popular lectures on the modern trends in the various basic sciences, some good films on scientific topics may be shown to the students. Workshop practice should form an essential part of this workshop and in addition to this, the students should be taken to places of scientific interest like the National Physical Laboratory, Defence Science Laboratory, Indian Meteorological Department, Delhi Chemical Works, All India Institute of Medical Sciences etc. The main feature of this workshop should be group and individual discussions.

The workshop was inaugurated by Prof. Humayun Kabir, the then Minister for Education, Govt. of India, on sixth October, 1963, at the Tutorial Library Buildings, Delhi University, Delhi and from that very day the work of the workshop started in right earnest. Lectures on popular topics were delivered by resource personnel every morning, followed by individual and group discussions. The students were further encouraged to develop some simple research designs for themselves which they could execute at their own colleges. Some of these popular lectures are printed as a separate publication of the Department of Science Education.

The valedictory function of the workshop was presided over by Dr. D. S. Kothari, Chairman, University Grants Commission, New Delhi. He gave away the scholarship awards and the book-grants to all the awardees.

It is proposed to hold such workshops for the 1963-64 awardees in the coming winter vacations. The outlines for such a workshop are being prepared at the Department of Science Education. The proposals for six weeks' Summer Institute in May, 1965 are also under consideration.

APPENDIX II

SAMPLE ITEMS FROM SCIENCE APTITUDE TEST, 1964

FACTUAL TYPE ITEMS

Q. 1. Critical angle for total internal reflection will be smallest for light travelling from

1. water to air ☐
2. water to glass ☐
3. glass to water ☐
4. glass to air ☐

Q. 2. A nuclear reactor (popularly also called atom pile) uses as fuel

1. graphite ☐
2. heavy water ☐
3. uranium ☐
4. beryllium ☐

Q. 3. Isotopes of an element have the same

1. atomic number ☐
2. atomic weight ☐
3. number of neutrons in their nuclei ☐
4. atomic volume ☐

Q. 4. The reaction in the Kipp's apparatus stops when the outlet is closed because

1. the acid gets weak ☐
2. a protective film is formed on iron sulphide ☐
3. gas starts coming out from the top ☐
4. gas pressure breaks the contact between ferrous sulphide and the acid ☐

Q. 5. The smallest value of x^2-5x+6 is

1. 1/4 ☐
2. —1/4 ☐
3. 0 ☐
4. 1 ☐

Q. 6. Which one of the following is correct

1. $\tan 90° = \infty$ ☐
2. $\tan 90° = -\infty$ ☐
3. $\tan 90° = \pm\infty$ ☐
4. tan 90° is meaningless ☐

Q. 7. The main difference between animal and plant cells is that :

1. animal cells lack rigid cell wall ☐
2. plant cells lack rigid cell wall ☐
3. an animal cell possesses a nucleus ☐
4. a plant cell possesses a nucleus ☐

Q. 8. Bile juice assists in the digestion of fats by

1. contributing a lipolytic enzyme ☐
2. stimulating the secretion of a lipase ☐
3. emulsifying fats ☐
4. increasing the alkalinity of the digestive medium ☐

Q. 9. Which one of the following meteorological elements always decreases with height

1. wind ☐
2. temperature ☐
3. pressure ☐
4. humidity ☐

Q. 10. Atmospheric pressure in current meteorological practice is measured in

1. pounds per square inch ☐
2. inches of mercury ☐
3. millibars ☐
4. centimetres of mercury ☐

Q. 11. The star known to be nearest to the sun is

1. sirius ☐
2. vega ☐
3. alpha centauri ☐
4. proxima centaur ☐

Q. 12. Black cotton soil is formed by

1. deposition of wind-borne sand and silt ☐
2. accumulation of products of weathering of rocks like basalt ☐
3. deposition of silt formed by erosion of black shales ☐
4. disintegration of rocks through frost action ☐

Q. 13. The most important sign of failing kidneys is

1. accumulation of protein in blood ☐
2. accumulation of nitrogenous waste products in blood ☐
3. yellow discolouration of body surface ☐
4. accumulation of sugar in blood ☐

Q. 14. Rectifiers are used to convert

1. electrical energy into mechanical energy ☐
2. heat energy into electrical energy ☐
3. high voltage to a low voltage ☐
4. alternating current to direct current ☐

Q. 15. In a water-logged field the plant roots die mainly because of

1. loss of plant nutrients by leaching ☐
2. lack of oxygen ☐
3. increased CO_2 concentration ☐
4. excessive humid conditions ☐

THOUGHT TYPE ITEMS

Section 1

Another difficulty in the classical theory arises from the electrodynamics of an accelerated electron. An electron moving in the field of a nucleus is accelerated, and classical electro-magnetic theory predicts that under these circumstances electro-magnetic energy will be radiated—the atom being in effect a microscopic radio transmitting station in which the charging currents in the antenna are represented by motions of the electrons. According to this theory an atomic system would continually radiate energy, and it could be proved that no equilibrium like that actually observed between matter and radiation would ever be achieved. Thus classical mechanics and electro-magnetics were incapable of taking the electrons and nuclei as building blocks and constructing solids or even atoms from them.

QUESTIONS ON SECTION 1

Q. 16. Matter is composed of

1. electrons ☐
2. nuclei ☐
3. electrons and nuclei ☐
4. electrons, nuclei and something else ☐

Q. 17. According to classical theory, if an electron is initially moving in a circular orbit around a nucleus

1. it will continue to do so for sometime ☐
2. it will continue to do so for all the time ☐
3. its orbit will continuously shrink ☐
4. its orbit will continuously enlarge ☐

Q. 18. Classical theory can explain

1. the stability of matter and atoms ☐
2. the stability of solids but not of atoms ☐
3. the stability of atoms but not of solids ☐
4. neither the stability of solids nor that of atoms ☐

Section 2

The atomic concept of matter is one of chemistry's major contributions to man's understanding of his material environment. The Daltonian concepts that the atoms of an element are the smallest indivisible units and are exactly alike in the same element have been modified considerably towards the turn of the century by :

a. the studies of Thomson on the passage of electricity through gases at low pressure,

b. the discovery of radio-activity and X-rays,

c. the development of the concept of nuclear model, and

d. the discovery of the phenomenon of 'isotopy' by Thomson and others.

The measurement of the charge of the electron by Millikan showed that it has the same value as the charge on a monovalent anion.

QUESTIONS ON SECTION 2

Q. 19. The concept of indivisibility of atoms was proved incorrect when

1. Faraday discovered the principles of electrolysis ☐
2. Thomson carried out his experiments with cathode rays ☐
3. Kossel gave the idea of the formation of electrovalent bonds ☐
4. Thomson discovered the phenomenon of isotopy ☐

Q. 20. Atoms are now regarded as

1. neutral spheres or balls ☐
2. spheres of positive electricity on the surface of which negatively charged electrons also reside ☐
3. nuclei of positively charged very condensed mass around which electrons revolve ☐
4. uniformly positively charged spheres containing electrons in the interior. ☐

Q. 21. The postulate of the alikeness of all atoms in the same element was proved incorrect by the discovery of

1. radioactivity ☐
2. isotopes ☐
3. allotropy ☐
4. cathode rays ☐

Section 3

Plants do not grow at the same rate throughout the year. The growth is at a maximum during spring. Plants transpire and breathe more in summer than in winter. During spring leaves and buds are formed; sap rises up the stems and plants increase in size. In autumn the herbaceous plants die down and deciduous trees lose their leaves. Trees are not active in winter ; there is no growth, and breathing and transpiration are just enough to keep them alive. Seasonal changes in the growth of a tree can be made out from the cut ends of its trunk. Rings, each of which represents one year's growth, can be counted and the age of the tree determined. These annual rings are formed by alternate layers of wood of different textures. Wood formed by rapidly growing trees in spring is not so dense and so dark as that formed in summer and early autumn. In autumn sap does not reach the leaves and they wither and fall. The fallen leaves rot to form leaf-mould which is a rich food for plants.

QUESTIONS ON SECTION 3

Q. 22. Most of our trees grow fastest in

1. autumn ☐
2. summer ☐
3. winter ☐
4. spring ☐

Q. 23. The leaves fall on the ground

1. because they fail to obtain the supply of food materials ☐
2. because they become heavy as they grow ☐
3. in the rainy season due to the weight of rain ☐
4. to provide rich food for plants in the form of leaf-mould ☐

Q. 24. The best method to determine the age of a tree is

1. to count the number of leaves on a tree ☐
2. to count the number of annual rings ☐
3. to measure its diameter ☐
4. to find out the number of branches ☐

Q. 25. Numerous new leaves and shoots in plants are produced

1. when the old ones fall off ☐
2. when the rainy season sets in ☐
3. when the weather cools down as in winter ☐
4. during spring ☐

Section 4

There are three main groups of rocks : (1) igneous rocks formed by the cooling and crystallising of molten material coming up from deep in the crust. Granite has been crystallised at depth—it is coarse-grained and is found along the roots of mountains. Basalt is fine-grained as it has been rapidly cooled and spread out as lava flows on land and ocean bottom. (2) Sedimentary rocks formed of sand, clay, lime, etc., deposited in bodies of water as beds. (3) Metamorphic rocks which have resulted from reconstitution of igneous or sedimentary rocks by heat and compression along folded mountain chains.

QUESTION ON SECTION 4

Q. 26. Which one of the following statements is correct ?

1. granite occurs as lava flows ☐
2. basalt is found along the root zone of mountains ☐
3. lava flows generally consist of basalt ☐
4. granite is deposited as beds on the ocean bottom ☐

Section 5

Mineral deposits are formed by various processes. Sulphides of metals are deprived from molten rocks (igneous rocks) and form veins and lenses in them or in other types of rocks. Remains of plants and animals—for example coal and limestones, composed of molluscan shells, corals, etc., are deposited as beds in lakes and seas. Certain salts like sodium chloride, calcium sulphate, potassium chloride are deposited in marine basins as bedded layers. China-clay, laterite and bauxite are formed as residual caps over pre-existing rocks on land.

QUESTION ON SECTION 5

Q. 27. Which one of the following statements is correct ?

1. copper sulphide veins are found in marine clays ☐
2. beds of rock salt indicate the existence of a former sea ☐
3. laterite veins are found traversing igneous rocks ☐
4. shell limestone is a product of weathering of granite ☐

Section 6

In the stomatch there are two protein attacking (proteolytic) enzymes, pepsin and rennin, though the latter is only present in any quantity in suckling mammals and is practically non-existent in the adult. Both are secreted as inactive proenzymes—pepsinogen and prorennin, but are converted to the active form by the hydrochloric acid of the stomach.

Pepsin is auto-catalytic as it is capable of converting pepsinogen to pepsin so that, once a small amount of it has been formed by acid hydrolysis, it catalyses its own formation.

Pepsin breaks down food proteins to proteoses and peptones which are still fairly complex compounds, made up of many amino-acids but nevertheless considerably simpler than the original protein.

Rennin acts primarily on the phosphoprotein of milk—casein, converting it to paracasein which combines with calcium ions in the stomach to form a curd and as the new-born mammal lives solely on milk, it is quite evident why rennin should be present at this stage of life.

QUESTIONS ON SECTION 6

Q. 28. Which one of the following statements is correct ?

1. pepsin converts pepsinogen into pepsin ☐
2. hydrochloric acid converts pepsin into pepsinogen ☐
3. pepsinogen is autocatalytic *i.e.* it can convert its ownself into pepsin ☐
4. once formed by hydrolysis, pepsin can convert pepsinogen into pepsin. ☐

Q. 29. Which one of the following statements is correct ?

1. pepsin brings about the complete breakdown of food proteins to amino-acids ☐
2. pepsin brings about the partial digestion of proteins ☐
3. pepsin can digest all carbohydrates ☐
4. pepsin can digest all fatty acids ☐

Q. 30. Which one among the following digests milk with the rennin of its stomach ?

1. a man ☐
2. any mammal ☐
3. a cow ☐
4. a calf ☐

APPENDIX III

SAMPLE TOPICS OF ESSAY-TYPE TEST

1. *Organic Evolution* :—Historical evidence from study of fossils-evidence from comparative embryology—Lamarck's theory of inheritance of acquired characters—theory of natural selection—rapid increase in numbers of living organisms—struggle for existence—survival of the fittest—role of mutation and hybridization—evolution of man—modern concepts of origin of new species.

2. *Atoms and Molecules* :—The observation that gases combine in definite proportions to form compounds and origin of the concepts of atoms—Dalton's theory—atomic weights—internal structure of atoms—electrons, protons, neutrons—discovery of X-rays, radioactivity and transmutation of elements—chemical energy and nuclear energy—fission in Uranium—the atom bomb.

3. *Human Foods* :—Next to air and water, food needed for preserving human body—balanced diet needed for healthy body—it requires : (*a*) proteins (*b*) fats and oils (*c*) carbohydrates (*d*) vitamins (*e*) minerals—animal and vegetable sources for these—functions of each of these—calorific values of foods; India short in food—change in our food habits to balance our diet.

4. *Birds with special reference to those found in your neighbourhood* :—What are birds?—kinds of birds—land birds, water birds, tropical birds, birds of prey, game birds, flightless birds, favourite song birds, colourful birds, the national bird of India—largest, smallest and fastest birds—language of birds, bird songs, bird calls, what birds eat? Birds eggs—young birds—bodies of birds—types of beak, feet and wing—How birds fly ?—bird migration—Why birds migrate?

APPENDIX IV

PROJECT REPORT

Identification of Dyes used in the Manufacture of Writing Inks by Paper-Chromatography

Kumari Manju Puri
Presentation Convent High School, Subhash Chandra Road, Delhi-6.

Selection of the problem

A simple observation of common occurrence made my task easy in deciding a problem to plan and write a project report for submission in the Science Talent Search Examination.

In the course of writing an essay on "How the life of the poor people of Delhi can be improved effectively", a big drop of royal blue ink, made by dissolving ink tablets in water, manufactured by M/s. Kores Ltd., Bombay, leaked out of my pen and spoiled a page of my neat exercise copy book. To prevent it from spreading and further disfiguring the page, I took a piece of blotting paper and applied it over the ink drop. Immediately all the ink was sucked up into the capillaries of the blotting paper leaving on the page a faint spot which was not worthy of any attention now. Out of appreciation for the quick workmanship of the blotting paper I had a glance at it and to my surprise I found that the edges of the blot were of a different colour from the centre, far end of the edges showing a violet shade and the inside of the blot displaying a distinct blue hue. This aroused my curiosity to know how an ink could display two shades although the watery solution gave an impression of only one dye being present in the ink.

I referred this observation to my father who told me that many inks contain more than one dye, in some instances several dyes of different colours are mixed to produce the required shade, while other dyes are obtained as mixtures of several coloured compounds. I was also told that such groups of compounds, having different properties also have different rates of absorption on to the surface particles of blotting paper. Thus, the materials which are not readily absorbed travel a greater distance from the centre of the blot, before their motion is stopped. He also referred me to one of the modern techniques called paper chromatography which finds considerable application in various industries and laboratories for the detection, characterization and estimation of dyes for colouring food stuffs, inks etc. My father casually remarked that a good deal of information can be collected from scientific literature and particularly recommended me to read some elementary books such as "The Elements of Chromatography" by Trevor Illtyd Williams, published by Blackie & Sons Ltd., and "Paper Chromatography" by Dr. Friedrich Crammer (of the University of Heidelberg) published by Macmillan & Co. Ltd., London. With this started my keen interest in this subject.

Since I am fond of visiting different libraries I was rewarded in one of my visits to British Council Library by coming across an article on "Chromatography" in one of the issues of the "Understanding Science" which deepened my interest further tn the subject of paper chromatography and I began to study this subject in some details, frequently visiting various libraries. In passing, it may be mentioned that my father is working as a Senior Scientific Officer in the Chemistry Division of National Physical Laboratory and all the experiments for this project were conducted by me in the same laboratory.

Design of the Experiment

The present investigation is directed towards the development of simple methods for the identification of various dyes used in writing inks.

In order to carry out a number of experiments on paper chromatography for the identification of various dye stuffs used in the manufacture of inks of different shades, a number of ink dyes available in the local market were collected from recognized, established dealers and also standard inks available in the market were obtained.

List of Standard Inks.	List of Standard dyes
(1) Quink Royal Blue (QRB)	(1) Ink Blue G. Conc (IB) (5p 5s 5m) chart No. IV
(2) Quink Blue Black (QBB)	(2) Methylene Blue 2B conc (MB) 8
(3) Quink Permanent Blue (QPB)	(3) Methyl Violet 2B-200 (MV)
(4) Weldon Royal Blue (WRB)	(4) Lissamine V.S. Green (VSG) 3
(5) Zebra Royal Blue (ZRB)	(5) Brilliant Acid green-BG (2)
(6) Zebra Blue Black (ZBB)	(6) Eosin Red YS (14)
(7) Weldon Blue Black (WBB)	(7) Croceine Scarlet 3BS (16)

(8) Sulekha Royal Blue (SRB)
(9) Sulekha Blue Black (SBB)
(10) Kores Blue Tablets (KOB)
(11) Kakkar Blue Tablets (KAB)
(12) Quink Green (QG)
(13) Zebra Green (ZG)
(14) Weldon Green (WG)
(15) Sulekha Green (SG)
(16) Quink Red (QR)
(17) Zebra Red (SR)
(18) Sulekha Red (SR)
(19) Weldon Red (WR)
(20) Kores Red (KOR)

(8) Naphthalene Scarlet 4RS (12)
(9) Durezol Red 2-BS (15)
(10) Acid Dark Green (4)
(11) Brilliant Blue 300 32(6)
(12) Yannime Blue (9)
(13) Soluble Blue SJ (10)
(14) Acid Violet 5 BG (17)
(15) Auranine 160 (19)
(16) Acid Black (21) (Blue+orange)
(17) Negrosin Black (Black+Yellow) (22)
(18) Naphthalene Black 12BS(23)

Apparatus

Micro pipettes were specially prepared to fit into glass phials of one ounce each to hold the inks and dye solutions.

The apparatus consisted of a bell jar (height 18 inches and diameter 12 inches) with a carefully ground phalange and a glass trough (8 inches in diameter) to hold the liquid and a glass plate for the bell jar to rest.

Whatman No I filter paper cut to 18 x 12 inches sizes was used. For the best results careful choice of the grade of paper is important, since they vary considerably in their behaviour notably in rate and uniformity of flow, carrying capacity and strength.

Solvents

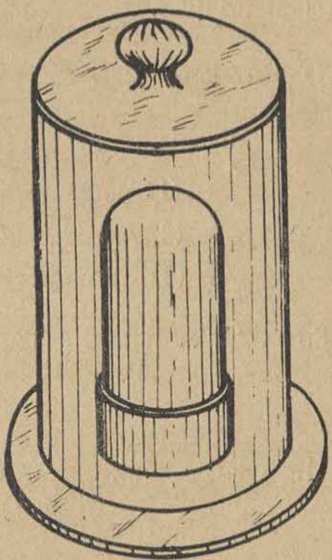
The Solvents I used were—

(1) (N) Butyl Alcohol —50 c.c.
(2) (3N) Acetic Acid —50 c.c.
(3) Ethyl Alcohol —20 c.c.

Functional Aspect

I placed the trough on a glass plate resting on a table. Into the trough, I added the mixture of solvents consisting of the above given constituents.

I placed the bell jar over the trough and left the apparatus overnight so that the atmosphere within the chamber may be saturated with the vapours of the solvent mixture.



Next morning I took a Whatman No 1 filter paper cut to 18 x 12 inches size and marked it with a starting line about 4 cm from the periphery of the filter paper and marked the individual starting points arranged at one inch intervals. Along the line for the various standard inks to be investigated, I applied the inks at the starting points directly with the nozzle of the micro pipette. The tiny drops spread out on the dry paper to circular spots which were allowed to dry for about half an hour. I curved filter paper round to form a cylinder and to prevent it from unrolling clipped it at the upper flap. I dipped the other end in the trough and filter paper. To prevent leakage of vapours, I applied a thin lining of silicone grease between the phalange of the bell jar and the supporting glass plate.

Capillary action drew the solvent through the paper and it migrated up past the ink spots under investigation. The individual dyes were then drawn along by the solvent at different velocities behind the liquid front. I left the paper in the developing solution from four to five hours after which I removed the sheet and left it to dry in the air for about one hour.

Every compound capable of being analysed chromatographically possesses a definite speed of migration in a defined solvent. A substance may thus be characterised by the speed at which it migrates. A measure of the velocity of migration of a compound is the so called R_f value, which is defined as the quotient of the distance of the substance from the starting point divided by the distance of the solvent from the starting point.

$$R_f = \frac{\text{Distance from the starting point of the substance}}{\text{Distance from the starting point to the solvent front}}$$

i. e. the ratio with respect to the front, hence the term R_f.

Experiments were made in two different media, acidic and alkaline. The same set of experiments were carried out with standard dyes which had been collected from the local market so that an easy comparative study may be made between the inks and the standard dyes. Identity of the dyes in the inks were obtained by the study of R_f values as compared to the standard dyes.

Observations

Solvents used with acidic medium

(1) Butyl alcohol	50 c.c.
(2) Acetic Acid	50 c.c.
(3) Ethyl Alcohol	20 c.c.

S.No.	Inks	Name of the dyes identified	R_f values of the ink dyes	Standard dyes	R_f values of the standard dyes
1.	QRB	Ink Blue G Conc. (Crystals)	0.42 0.33 0·24 0·18	Ink Blue G Conc. (Crystals)	0.42 0.33 0·24 0·18
2.	ZRB	Ink Blue G Conc. (Crystals)	0·42 0·33 0·24 0·18	Ink Blue G Conc. (Crystals)	0·42 0·33 0·24 0·18
3.	WRB	Ink Blue G. Conc. (Crystals)	0·42 0·33 0·24 0·18	Ink Blue G Conc. (Crystals)	0·42 0·33 0·24 0·18
4.	SRB	Ink Blue G Conc. (Crystals)	0·42 0·33 0·24 0·18	Ink Blue G. Conc. (Crystals)	0·42 0·33 0·24 0·18
5.	KOB	Methylene Blue 2B Conc. and Methyl Violet 2B—200	0·87 0·99	Methylene Blue 2B Conc. and Methyl Violet 2B—200	0·87 0·99
6.	QBB	Ink Blue G Conc. (Crystals)	0·42 0·33 0·24 0·18	Ink Blue G. Conc. (Crystals)	0·42 0·33 0·24 0·18

7.	ZBB	Ink Blue G Conc. (Crystals)	0·42 0·33 0·24 0·18	Ink Blue G. Conc. (Crystals)	0·42 0·33 0·24 0·18
8.	SBB	Ink Blue G Conc. (Crystals)	0·42 0·33 0·24 0·18	Ink Blue G. Conc. (Crystals)	0·42 0·33 0·24 0·18
9.	WBB	Ink Blue G Conc. (Crystals)	0·42 0·33 0·24 0·18	Ink Blue G Conc. (Crystals)	0·42 0·33 0·24 0·18
10.	QPB	Ink Blue G. Conc. (Crystals)	0·42 0·33 0·24 0·18	Ink Blue G. Conc. (Crystals)	0·42 0·33 0·24 0·18
11.	KAB	Methyl Violet 2B-200	0·87	Methyl Violet 2B-200	0·87
12.	QG	Unidentified	0·67		—
13.	ZG	Brilliant Acid Green-BG	0·82	Brilliant Acid Green-BG	0·82
14.	SG	Brilliant Acid Green-BG and Lissamine V.S.Green	0.82 0·72	Brilliant Acid Green-BG and Lissamine V.S.Green	0·82 0·72
15.	WG	Brilliant Acid Green—BG	0·82	Brilliant Acid Green—BG	0·82
16.	QR	Naphthalene Scarlet—4RS and Durazol Red 2 BS	0·27	Naphthalene Scarlet—4 RS and Durazol Red 2 BS	0·27
17.	ZR	Croceine Scarlet—3B	0.76	Croceine scarlet 3 BS	0·76
18.	SR	Eosin Red YS	0·97	Eosin Red YS	0·97
19.	WR	Unidentified	—		—
20.	KOR	Croceine Scarlet 3 BS	0·76	Croceine scarlet 3 BS	0·76

Interpretation of Data

The table shown above gives the R_f values of the various dyes present in the different standard brands of inks. The similarity in the R_f values indicates which standard dyes are present in the inks.

All the inks in the shades of Royal Blue, Permanent Blue and Blue Black are based on the same dye, that is ink Blue G Conc. (Crystals). This dye is composed of four isotopes which are clearly indicated in the chromatograms attached.

Blue ink tablets manufactured by M/s. Kores Ltd. consist of a mixture of two dyes, that is Methylene Blue—6B conc. and Methyl violet 2B—200. The dye in the Quink green remains unidentified as the corresponding standard dye with the same R_f value could not be found. The green dye in the inks Zebra and Weldon brands is identical and is Brilliant Acid green—BG but Sulekha contains a mixture of two dyes Brilliant Acid green—BG and Lissammine V and Green.

The red dye Croceine scarlet—3 BS is present both in Zebra fluid ink and Kores red tablets. The red dye in Sulekha ink is based on Eosin Red Ys. The Weldon red ink dye remains unidentified. Quink red ink is a mixture of Naphthalene scarlet—4RS and Durazol scarlet—2BS which shows tailing.

The great merit of this technique apart from simplicity is that it is extremely delicate; a few micrograms of a substance being easily detected under suitable conditions.

Limitations

The paper chromatographic method is primarily of qualitative application and it only works with dilute solutions.

The substance to be identified should be at least slightly water soluble otherwise it will not be retained at all by the stamp paper and then will not of course form any clear spots. As a general rule no successful results are obtainable for a substance migrating with R_f value greater than 0.9. The substance should also be slightly soluble in the organic solvents used.

Paper chromatography is only applicable if the substance to be identified, is visible on the paper by some physical property or chemical reaction. The substance should neither react with the cellulose of the paper nor the solvent.

Summary

Acidic medium is the most suitable medium for the detection of ink dyes. The resolution of the dyes in the inks is not sharp and well defined in the alkaline medium as shown by the Chromatogram No. 3. The dye named Ink blue G-Conc does not migrate at all in the alkaline medium. At first it becomes invisible but reappears after the sheet has been taken out and the solvent evaporated. The various dyes give different R_f values in different solvents.

As the advantages of paper chromatography are great combined with simplicity, it is finding wide spread application in industry. Paper chromatography may be regarded as one of the most significant achievements of organic chemical research technique.

Bibliography

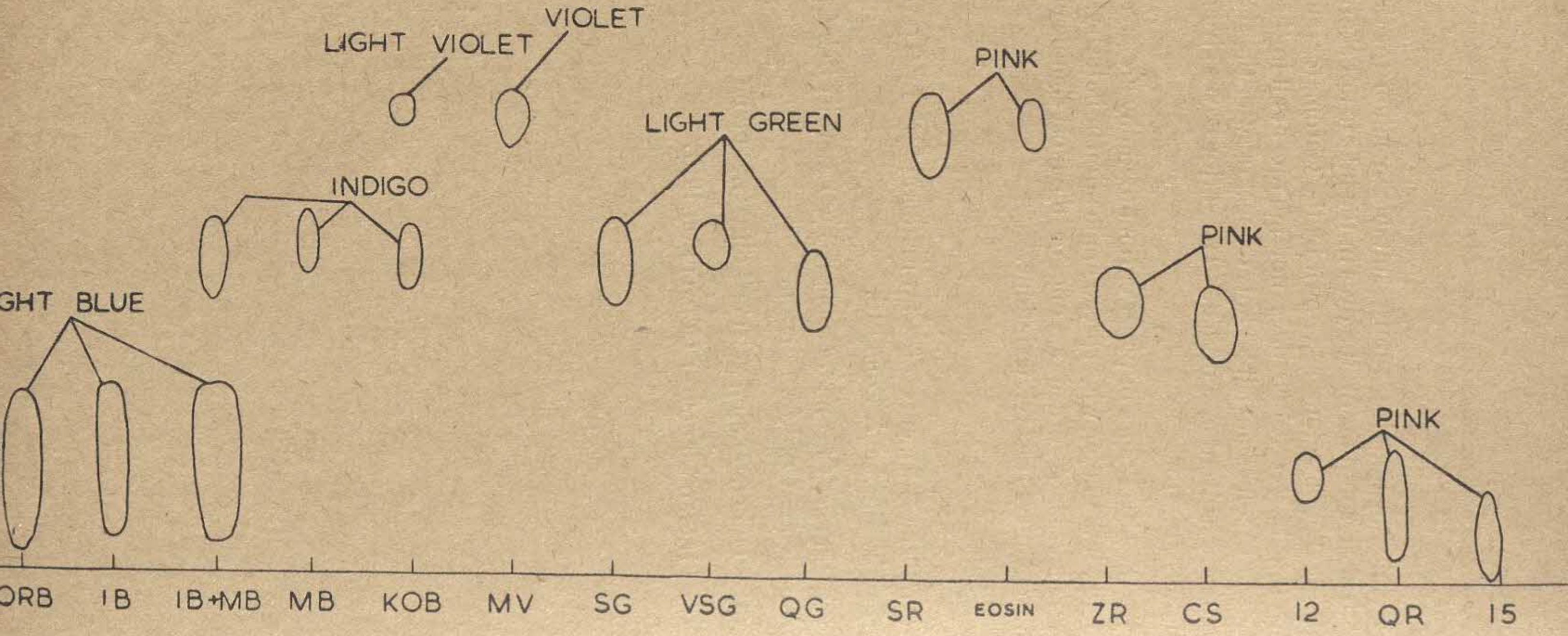
(1) "The Elements of Chromatography" by Trevor Illtyd Williams, Published by Blackie & Sons Ltd.

(2) "Paper Chromatography" by Dr. Friedrick Crammer, published by Macmillan & Co. Ltd. London.

(3) "Understanding Science" different volumes.

(4) "Indian Standards Convention 1957."

CHROMATOGRAM — I

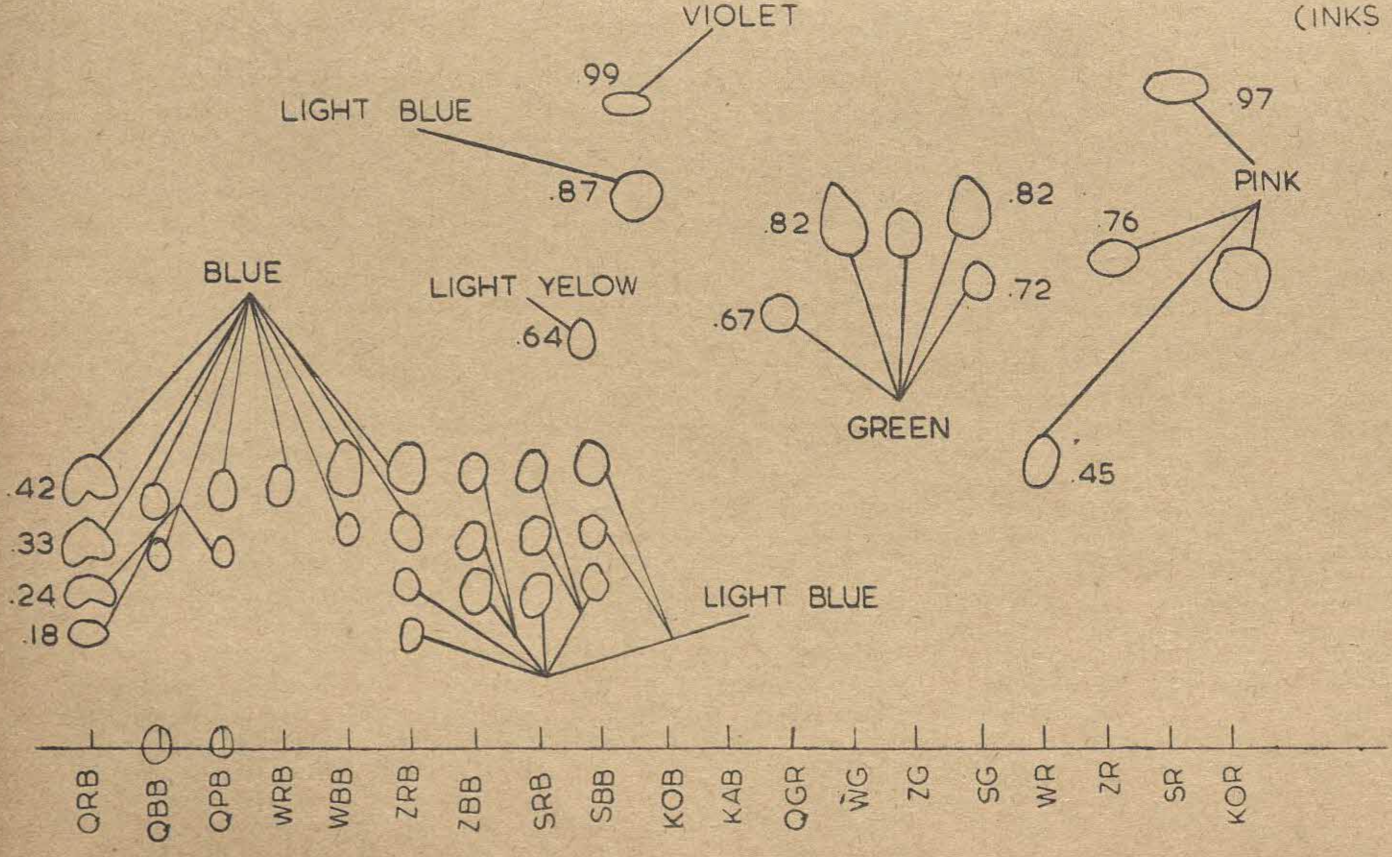


CHROMATOGRAM 2

SOLVENTS USED

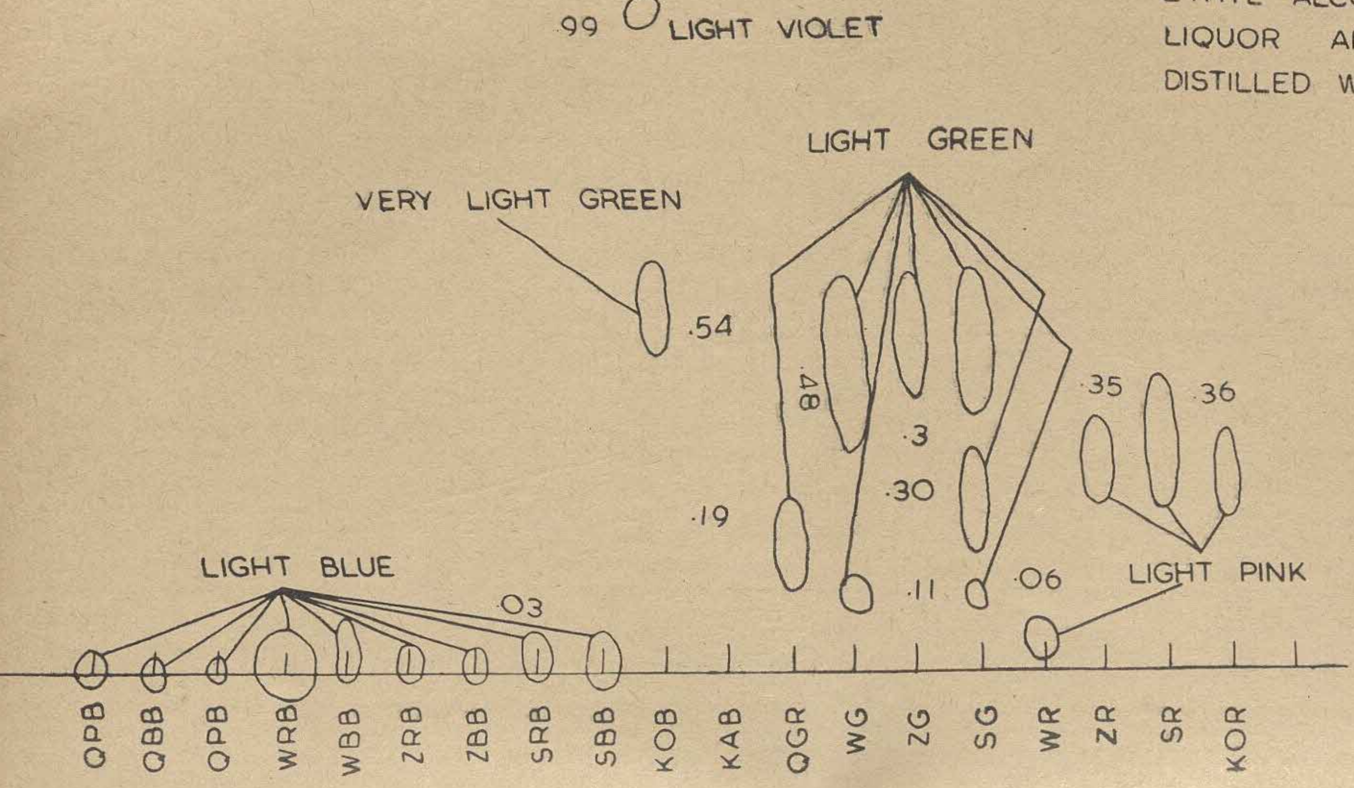
n. BUTYL ALCOHOL	50 c.c
3n. ACETIC ACID	50 c.c.
ETHYL ALCOHOL	20 c.c

(INKS ONLY)



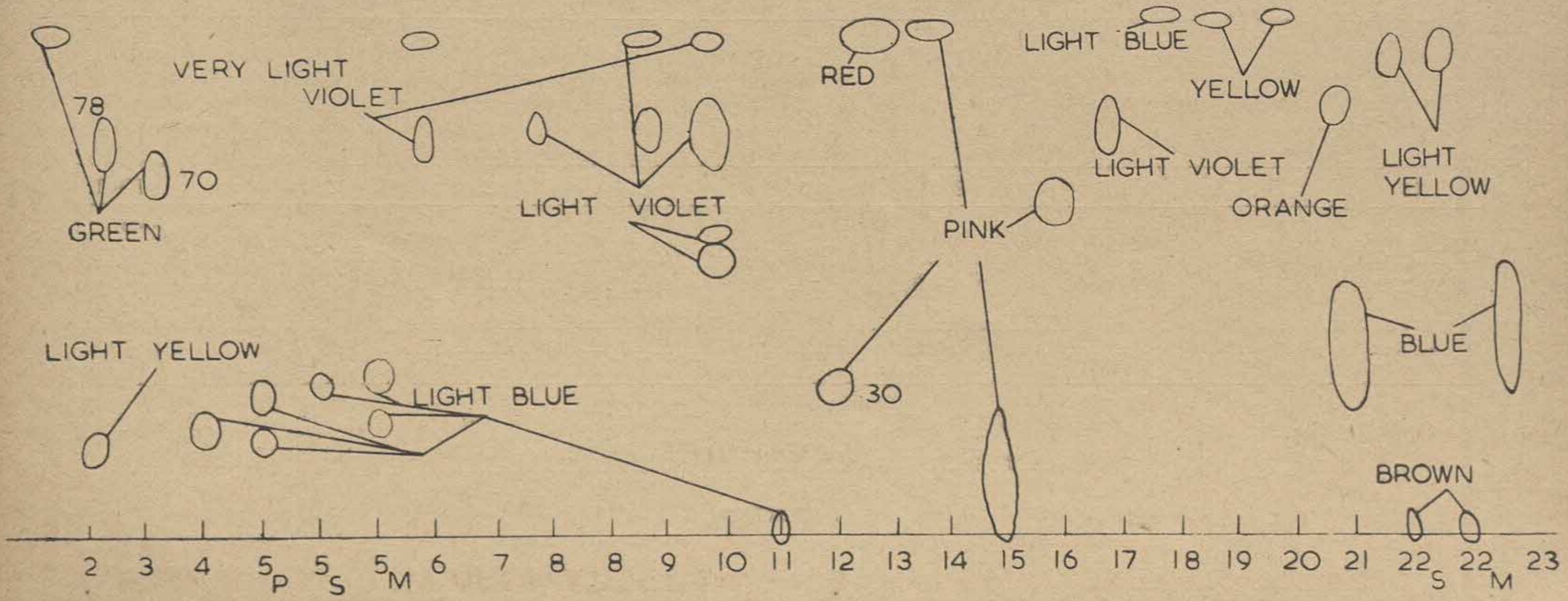
CHROMATOGRAM — 3

ISO-AMYL ALCOHOL	40 c.c.
ETHYL ALCOHOL	40 c.c.
LIQUOR AMMONIA	10 c.c.
DISTILLED WATER	10 c.c.



CHROMATOGRAM — 4

nBUTYL ALCOHOL 50 c.c.
3nACETIC ACID 50 c.c.
ETHYL ALCOHOL 20 c.c.
● (DYES ONLY)



APPENDIX V

AREAWISE ITEMS OF THE SCIENCE APTITUDE TEST, 1964

(Quoting actual number of test items from the test along with the arrangement)

I	*Physics*	*Chemistry*	*Mathematics*	*Botany*	*Zoology*	*Meteorology*	*Astronomy*	*Geology*
Factual Type items	1-10(10)	11-20(10)	21-27(7)	28-31(4)	32-35 (4)	36-40 (5)	41-45 (5)	46-50 (5)
Thought Type Items	66-75(10)	76-85(10)	86-92(7)	93-96(4)	97-100(4)	101-105(5)	106-110(5)	111-115(5)
Total	20	20	14	8	8	10	10	10

I	*Physiology & Hygiene*	*Engineering*	*Agriculture*	*History & Philosophy of science*	*Biophysics*	*Biochemistry*
Factual Type Items	51-55 (5)	56-60 (5)	61-65 (5)	X (0)	X (0)	X (0)
Thought Type Items	116-120(5)	121-125(5)	126-130(5)	131—140(10)	141—150(10)	151—160(10)
Total	10	10	10	10	10	10

APPENDIX VI

THOUGHT TYPE ITEMS—AN ANALYSIS

Area	*Serial of Sections*	*Number of passages*	*Number of items from each area*	*Average number of items per passage*
1	2	3	4	5
Physics	1— 4	4	10	2.50
Chemistry	5— 8	4	10	2.50
Mathematics	9—10	2	7	3.50
Botany	11	1	4	4.00
Zoology	12—13	2	4	2.00
Meteorology	14—15	2	5	2.50
Astronomy	16—17	2	5	2.50
Geology	18—21	4	5	1.25
Physiology & Hygiene	22—23	2	5	2.50
Engineering	24—25	2	5	2.50
Agriculture	26—28	3	5	1.67
History & Philosophy of Science	29—31	3	10	3.33
Bio-Physics	32—35	4	10	2.50
Bio-Chemistry	36—38	3	10	3.33
		38	95	

APPENDIX VII (A)

THE MERIT LIST (FOR THE AWARD OF SCHOLARSHIP)

These names have been arranged in order of merit. Only those will be considered for the final award who satisfy the conditions laid down by the Department of Science Education, National Council of Educational Research and Training, Delhi.

S.No.	*Rank*	*Roll No.*	*Name of the contestant*	*Marks obtained*	*State/territory from which appeared*	*Courses Joined*
1.	2.	3.	4.	5.	6.	7.
1.	1	1833	Sh. J. Hari Narayan	245	Delhi	B.Sc.
2.	2	49027	Sh. Amitava Gupta	238	M.S.	Inter Sc.
3.	3	41886	Sh. Avijit Mukherjee	224	W.B.	B.Sc.
4.	4	773	Km. Rama Daga	218	Delhi	B.Sc.
5.	5	772	Km. Rajashree Gupta	213	Delhi	B.Sc.
6.	6	19802	Sh. A. Thyagaraja	212	Madras	B.Sc.
7.	7	41673	Sh. Pranab Kumar Ghosh	205	W.B.	B.Sc.
8.	8	49245	Sh. N. Vidyanand	202	M.S.	Inter Sc.
9.	9	499	Sh. Trayam Keshwar P.N. Sinha	200	Delhi	Engg.
10.	9	739	Sh. S. Viswanathan	200	Delhi	B.Sc.
11.	9	744	Sh. C.V. Iswaran	200	,,	Engg.
12.	9	47103	Sh. R.N. Chakravarti	200	Mysore	B.Sc.
13.	13	19894	Sh. Rajaram Nityananda	198	Madras	B.Sc.
14.	14	25361	Sh. Madanjit Singh Ahluwalia	196	Punjab	B.Sc.
15.	15	1521	Sh. Vijay Sarin	192	Delhi	Engg.
16.	16	37137	Sh. Anurag Bhatnagar	191	U.P.	Inter Sc.
17.	16	45162	Sh. Kamlesh Kumar	191	M.P.	B.Sc.
18.	18	962	Sh. Ashok Kumar Chandra	190	Delhi	Engg.
19.	18	351	Sh. Arun Kumar Bansil	190	Delhi	B.Sc.
20.	20	1951	Km. Rama Anand	189	Delhi	Pre-Med.
21.	20	38182	Sh. Ashok Kumar Sharma	189	U.P.	Inter Sc.
22.	22	41824	Sh. Saugata Roy	188	W.B.	B.Sc.
23.	22	11959	Km. Nilima Chatterjee	188	M.P.	B.Sc.
24.	22	34263	Sh. Brajendra Bhatnagar	188	U.P.	Inter Sc.
25.	22	23401	Sh. Devinder Singh Garewal	188	Punjab	B.Sc.
26.	26	1844	Km. Manju Puri	186	Delhi	B.Sc.
27.	27	743	Km. L. Indra	184	Delhi	B.Sc.
28.	27	35740	Sh. Ashok Gupta	184	U.P.	Inter Sc.
29.	27	49149	Sh. Panse Sudhir Vishnu	184	M.S.	Inter Sc.

1.	2.	3.	4.	5.	6.	7.
30.	30	17805	Sh. Dani Shrikrishna Gopalrao	182	Mysore	B.Sc.
31.	30	3020	Sh. Eshwar Tenneti	182	A.P.	No reply
32.	30	25509	Sh. Punam Chand Jain	182	Punjab	Pre-Med.
33.	30	10903	Sh. Ghanshyam Sahu	182	M.P.	Not eligible
34.	34	49126	Sh. K. Ramani	180	M.S.	Inter Sc.
35.	35	49247	Km. Khorshed Madan	179	„	—do—
36.	35	49248	Km. Shakuntala Gurnani	179	„	—do—
37.	35	49238	Sh. Pramod Madhusudan Lad	179	„	Foreign University
38.	38	705	Sh. Ravinder Kumar Zutshi	178	Delhi	Engg.
39.	39	733	Sh. V.P. Raja	177	„	B.Sc.
40.	39	8002	Sh. Kartikeya Vikram Sarabhai	177	Gujrat	B.Sc.
41.	41	26012	Sh. Swatantra Paul Thapar	176	Punjab	No reply
42.	42	49135	Sh. P.V. Shridhar	175	M.S.	Engg.
43.	42	745	Sh. C.E. Veni Madhavan	175	Delhi	Engg.
44.	42	41603	Sh. Bhubanmohan Das	175	W.B.	Engg.
45.	45	7613	Sh. Raghunath Prasad Khetan	175	Bihar	Engg.
46.	46	41660	Sh. Amitabha Pal	174	W.B.	Engg.
47.	47	41771	Sh. Tapan Kumar Biswas	173	„	Pre-Med.
48.	47	48218	Sh. Lobo Rudolph	173	Mysore	Engg.
49.	47	467	Sh. Bakshy Aksnay Kirti Chibber	173	Delhi	B.Sc.
50.	47	951	Sh. Ajay Nagnath Taskar	173	„	Engg.
51.	47	10597	Sh. Nand Kishore Tiwari	173	M.P.	B.Sc.
52.	52	8109	Sh. Asnani Narayan Jiwatram	172	Gujrat	B.Sc.
53.	52	879	Km. Radha Chakravarthy	172	Delhi	B.Sc.
54.	54	41888	Sh. Kamal Kumar Raychaudhri	171	W.B.	B.Sc.
55.	54	8516	Sh. Potbharevijay Narayan	171	Gujrat	B.Sc.
56.	56	41919	Km. Bina Rohatgi	170	W.B.	B.Sc.
57.	56	937	Sh. Avtar Singh	170	Delhi	Engg.
58.	56	750	Sh. T.R. Srinivasan	170	„	B.Sc.
59.	56	7083	Sh. Cornel Joseph Rosario	170	Bihar	B.Sc.
60.	56	957	Sh. Seshan Krishna	170	Delhi	Engg.
61.	56	1645	Sh. K. Gopala Krishna	170	„	Engg.
62.	62	41971	Sh. Arunava Sen Gupta	168	W.B.	B.Sc.
63.	62	17613	Sh. Vijay Govindarajan	168	Mysore	Technical
64.	62	1662	Sh. Nand Kumar B. Khemchandani	168	Delhi	Engg.
65.	65	751	Km. Gita Dev	167	„	Engg.
66.	65	756	Km. Kusum Lata Sharma	167	„	Pre-Med.
67.	65	1588	Sh. Anil BalKrishna Parajpye	167	„	Technical
68.	68	17524	Sh. Sathya Narayana M.S.	166	Mysore	Engg.
69.	68	30305	Km. Neerja Gupta	166	U.P.	Not eligible
70.	68	25108	Sh. Jasjit Singh	166	Punjab	B.Sc.
71.	68	1895	Km. Praveen Nanda	166	Delhi	Pre-Med.
72.	72	737	Sh. Ravi Sampath	165	Delhi	B.Sc.
73.	72	49024	Sh. Srinivasan Seshadri	165	M.S.	Engg.

1.	2.	3.	4.	5.	6.	7.
74.	72	49249	Km. Sherna Madan	165	M.S.	Inter Sc.
75.	75	1654	Sh. Sathaye Jayant Anant	164	Delhi	No reply
76.	75	34128	Km. Shashi Bala Agarwal	164	U.P.	Inter Sc.
77.	77	774	Km. Archana Chatterji	163	Delhi	B.Sc.
78.	77	41870	Sh. Dutta Ashok Kumar	163	W.B.	B.Sc.
79.	77	43197	Sh. Sankar Kumar Mitra	163	,,	Engg.
80.	77	6360	Sh. Soumitri Sankar Guha	163	Assam	Engg.
81.	77	25101	Sh. Param Jit Singh Virdi	163	Punjab	Pre-Med.
82.	82	35702	Sh. Anand Kapoor	162	U.P.	Not eligible
83.	82	14854	Sh. Naik Sunil Sakharam	162	M.S.	Inter Sc.
84.	84	1847	Km. S.V. Annapurna	161	Delhi	B.A.
85.	84	22525	Sh. Bikash Roy Choudhury	161	Orissa	B.Sc.
86.	84	934	Sh. Aditya Kumar Ahuja	161	Delhi	No reply
87.	84	35779	Sh. Rajiv Ittyerah	161	U.P.	Not eligible
88.	88	871	Sh. M.K. Chandrasokharan	160	Delhi	B.Sc.
89.	88	41915	Km. Jayasree Bose	160	W.B.	B.Sc.
90.	88	778	Km. Y.S. Hemnalini	160	Delhi	Pre-Med.
91.	91	958	Sh. A.A. Pathak	159	,,	Technical
92.	91	1766	Sh. Subhash Bhatia	159	,,	B.Sc.
93.	91	1952	Km. Bhawna Gaind	159	,,	Pre-Med.
94.	94	14003	Sh. Burte Prakash Pandurang	158	M.S.	B.Sc.
95.	94	41912	Km. Rita Adhya	158	W.B.	B.Sc.
96.	94	22372	Sh. Jayadev Misra	158	Orissa	Engg.
97.	94	1832	Sh. Kannan Krishnan	158	Delhi	Engg.
98.	94	874	Sh. K. Kalyanaraman	158	Delhi	Engg.
99.	94	38291	Sh. Sudarshan Lahiry	158	U.P.	Inter Sc.
100.	100	1729	Sh. Yogesh Kumar Jain	157	Delhi	Engg.
101.	100	738	Km. V. Ratna	157	Delhi	B.Sc.
102.	100	1520	Sh. Avdhesh Kumar	157	,,	Engg.
103.	100	1545	Sh. K. A. Ananthanarayanan	157	,,	Engg.
104.	100	1561	Sh. Ambrish Kumar Bansal	157	,,	Engg.
105.	105	43518	Sh. Anup Majumder	156	W.B.	Engg.
106.	105	1652	Sh. Sushil Kumar Kapoor	156	Delhi	Engg.
107.	105	30310	Sh. Yogi Krishen Agarwal	156	U.P.	Not eligible
108.	105	32891	Sh. Vijay Kumar Aggarwal	156	,,	Inter Sc.
109.	105	35868	Sh. Brijendra Pal Singh	156	,,	Inter Sc.
110.	105	25702	Sh. Rajendra Singh Raghow	156	Punjab	B.Sc.
111.	111	45019	Sh. Jagadish Chandra Naredi	155	M.P.	Technical
112.	111	15741	Km. Lata Dattatraya Jayawant	155	M.S.	B.Sc.
113.	111	49023	Sh. Prakash Vinayak Joshi	155	,,	Inter Sc.
114.	111	10902	Sh. Pronoy Kumar Bakshi	155	M.P.	Not eligible
115.	111	877	Sh. J. Jayaraman	155	Delhi	Engg.
116.	111	1841	Sh. Gopal Rajaram	155	,,	B.Sc.
117.	117	23273	Sh. Devinder Singh	154	Punjab	Pre-Med.
118.	117	22829	Km. Renuka	154	,,	Pre-Med.
119.	117	952	Sh. Janak Raj	154	Delhi	Engg.
120.	120	41669	Sh. Ambar Nath Chakravarty	153	W.B.	Pre-Med.

1.	2.	3.	4.	5.	6.	7.
121.	120	41893	Sh. Arun Kumar Das	153	W.B.	Engg.
122.	120	6062	Sh. S. Gopinath Kamath	153	Assam	B.Sc.
123.	120	1873	Km. Nita Gupta	153	Delhi	B.Sc.
124.	120	749	Sh. K. Narayanan	153	,,	Engg.
125.	125	12572	Sh. Amar Singh	152	M.P.	B.Sc.
126.	125	942	Sh. Kuldip Singh Virdi	152	Delhi	Engg.
127.	125	510	Sh. Jawahar Chatpar	152	,,	Engg.
128.	125	747	Sh. V. Ranga	152	,,	Pre-Med.
129.	125	27027	Sh. Naresh Kumar Palta	152	Punjab	Pre-Engg.
130.	125	25496	Sh. Ram Kumar Gupta	152	,,	B.Sc.
131.	125	25363	Sh. Gopal Narain Bhatia	152	,,	B.Sc.
132.	132	41891	Sh. M. Shahidulla Mallik	151	W.B.	Not joining
133.	132	43748	Sh. Biswajit Chattoraj	151	W.B.	B.Sc.
134.	132	703	Sh. Rajendra Kumar Rustgi	151	Delhi	Engg.
135.	132	735	Sh. T. R. Ranganathan	151	,,	B.Sc.
136.	132	36782	Sh. Pankaj Sharan	151	U.P.	Inter Sc.
137.	137	10408	Sh. Indraneel Sen	150	M.P.	B.Sc.
138.	137	12919	Sh. Rita Chordia	150	,,	B.Sc.
139.	137	10900	Sh. Syed Aftab Rizvi	150	,,	Not eligible
140.	137	12311	Sh. Arun Kumar Dwivedi	150	,,	Not eligible
141.	137	14028	Sh. Knobare Shripal Krishna Trao	150	M.S.	B.Sc.
142.	137	14877	Sh. Merchant Deepak Kanchanlal	150	,,	Engg.
143.	137	49095	Sh. Joshi Madav Jayaram	150	,,	Engg.
144.	137	41890	Sh. Mustaque Ali Haldar	150	W.B.	Not joining
145.	137	1640	Sh. Vijay Kumar Kapoor	150	Delhi	Engg.
146.	137	963	Sh. Ravinder Nath Sharma	150	,,	Engg.
147.	137	944	Sh. Gopal Krishan	150	,,	Engg.
148.	137	741	Km. R. Padma	150	,,	B.Sc.
149.	137	36029	Sh. Jyoti Asthana	150	U.P.	Not eligible
150.	150	45077	Km. Gurdeep Kaur Nagpaul	149	M.P.	B.Sc.
151.	150	15720	Sh. P. Sundaram	149	M.S.	Engg.
152.	150	12352	Sh. Phalle Dilip Yashwant	149	,,	B.Sc.
153.	150	49026	Sh. Dandeka Shrikrishna Sakharam	149	,,	Inter Sc.
154.	150	1059	Km. S. Mythili	149	Pondicherry	B.Sc.
155.	150	846	Sh. Ashok Marwah	149	Delhi	Engg.
156.	150	1542	Sh. Sarnagat Singh	149	,,	Engg.
157.	150	746	Sh. G. K. Mani	149	,,	Pre-Med.
158.	150	34532	Sh. Bhoopendra Nath Tripathi	149	U.P.	Not eligible
159.	159	964	Sh. Narain Gehani	148	Delhi	Engg.
160.	159	1902	Km. Shashi Khanna	148	,,	Pre-Med.
161.	159	22857	Km. Davinder Kaur	148	Punjab	B.Sc.
162.	159	25107	Sh. Bhupinder Singh	148	,,	B.Sc.
163.	159	23438	Sh. Subhash Chander	148	,,	Pre-Med.
164.	164	45159	Km. Kalpana Singh	147	M.P.	B.Sc.

1	2	3	4	5	6	7
165.	164	41668	Sh. Satish Kumar Tripathi	147	W.B.	B.Sc.
166.	164	41988	Sh. Mriganka Majumdar	147	W.B.	Engg.
167.	164	6059	Sh. Tapan Kumar Chakrabarty	147	Assam	B.Sc.
168.	164	19031	Sh. V. P. Subra Mainian	147	Madras	Medical
169.	164	25342	Sh. Chander Kant	147	Punjab	B.Sc.
170.	164	30319	Sh. Lalit Pande	147	U.P.	Inter Sc.
171.	164	25425	Sh. Ishwar Kumar	147	Punjab	B.Sc.
172.	164	46757	Km. Mehrunissa Ali	147	Mysore	B.Sc.
173.	173	49025	Sh. Dilip Chandra Sekharan	146	M.S.	Inter Sc.
174.	173	41991	Sh. Abhijit Mitra	146	W.B.	B.Sc.
175.	173	5873	Sh. Rajendra Prasad Sarma	146	Assam	B.Sc.
176.	173	19883	Sh. Putti Ramamurthy Bindumadhvan	146	Madras	B.Sc.
177.	173	860	Sh. L.V. Ramanathan	146	Delhi	Engg.
178.	173	967	Sh. Anil Kumar Dang	146	Delhi	Engg.
179.	173	23426	Sh. Narinder Kumar	146	Punjab	Pre-Med.
180.	173	36030	Sh. Vishwa Kumar Verma	146	U.P.	Not eligible
181.	181	9148	Sh. Bhatt Prabhashankar Hathibhai	145	Gujrat	Will not join B.Sc.
182.	181	49146	Sh. Rao Rajagopal Subba Rao	145	M.S.	Inter Sc.
183.	181	15761	Sh. Ashok Vithal Rao Pimpale	145	M.S.	B.Sc.
184.	181	6334	Sh. Carelit Lamar	145	Assam	B.Sc.
185.	181	1907	Km. Anita Kapur	145	Delhi	Under-age
186.	181	513	Sh. Kiron Kishore Kohli	145	Delhi	Pre-Engg.
187.	181	34342	Sh. Vijay Kumar Singh	145	U.P.	Inter Sc.
188.	181	35747	Sh. Rajendra Parsad Sinha	145	,,	Inter Sc.
189.	181	25494	Sh. Satya Pal Singh	145	Punjab	B.Sc.
190.	181	24009	Sh. Om Parkash Sud	145	,,	Pre-Engg.
191.	191	15722	Sh. Albert E. D'lima	144	M.S.	No reply
192.	191	30308	Sh. Mukul Sanwal	144	U.P.	No reply
193.	191	35738	Sh. Ashok Kumar Jain	144	,,	Inter Sc.
194.	194	15751	Sh. Sadanand Viswambhar Bhave	143	M.S.	B.Sc.
195.	194	20141	Km. N. Chittra	143	Madras	B.Sc.
196.	194	353	Sh. Rajesh Kumar Kaura	143	Delhi	Engg.
197.	194	1901	Km. Purnima Chakravarty	143	,,	B.Sc.
198.	194	35706	Sh. Abhaya Kumar Ashtana	143	U.P.	Not eligible
199.	199	8029	Km. Shah Dina Kanti Lal	142	Gujrat	B.Sc.
200.	199	12452	Sh. Pramod Kumar Sharma	142	M.P.	B.Sc.
201.	199	13780	Km. Sulochana Damodar Konkar	142	M.S.	B.Sc.
202.	199	14907	Km. Clarita Henriques	142	,,	Inter Sc.
203.	199	41562	Km. Gopa Sarkar	142	W.B.	B.Sc.
204.	199	41889	Sh. Rajendra Paul Verma	142	W.B.	B.Sc.
205.	199	22251	Sh. Hareram Mohantry	142	Orissa	B.Sc.
206.	199	6313	Sh. Satyendra Nath Sarmah	142	Assam	B.Sc.
207.	199	20179	Sh. A. Natesan	142	Madras	Medical

1	2	3	4	5	6	7
208.	199	827	Sh. Anoop Krishan Sud	142	Delhi	B.Sc.
209.	199	352	Sh. Ashok Vinayak Karnik	142	Delhi	Engg.
210.	199	35766	Sh. Vikram Soni	142	U.P.	Not eligible
211.	199	23424	Sh. Manohar Lal Sidana	142	Punjab	Pre-Engg.
212.	199	34517	Km. Nirupma	142	U.P.	Inter Sc.
213.	213	8232	Sh. Patel Janak Himatlal	141	Gujrat	B.Sc.
214.	213	15675	Sh. Madhusudan Madan Bhagwat	141	M.S.	B.Sc.
215.	213	13715	Sh. Deshmukh Arun Bhaurao	141	M.S.	B.Sc.
216.	213	41663	Sh. Basudeb Datta	141	W.B.	No reply
217.	213	970	Sh. Jegath Chandra Giri	141	Delhi	Technical
218.	213	1585	Sh. Sutendra Kumar	141	Delhi	B.Sc.
219.	213	34952	Sh. Ravindra Kumar	141	U.P.	Inter Sc.
220.	220	10663	Sh. Sharad G. Wagle	140	M.P.	No reply
221.	220	41920	Km. Pushpita Basu	140	W.B.	B.Sc.
222.	220	1591	Sh. Vijay Kumar Singhal	140	Delhi	Engg.
223.	220	1893	Km. Cheena Mathur	140	Delhi	B.Sc.
224.	220	30464	Sh. Kishori Lal	140	U.P.	Inter Sc.
225.	220	24333	Sh. Bikash Sarma	140	,,	Inter Sc.
226.	220	24017	Km. Veena Rani Sood	140	Punjab	Pre-Med.
227.	220	701	Sh. Yash Paul Narula	140	Delhi	B.Sc.
228.	228	11951	Km. Ratnamala Kulkarni	139	M.P.	B.Sc.
229.	228	41885	Sh. Pritish Nandy	139	W.B.	B.Sc.
230.	228	7035	Sh. Biswajit Aikat	139	Bihar	Engg.
231.	228	1639	Sh. Rajendra Prakash Lav	139	Delhi	Engg.
232.	228	19908	Sh. K. Sambamurthy	139	Madras	Engg.
233.	228	2270	Sh. K. S. Vedachalam	139	A.P.	Engg.
234.	228	29087	Sh. Bhanwar Singh	139	Raj.	No reply
235.	228	740	Km. R. G. Rani	139	Delhi	B.Sc.
236.	228	22881	Sh. Surinder Dutt Sharma	139	Punjab	B.Sc.
237.	228	26048	Km. Urvashi	139	,,	B.Sc.
238.	228	25418	Sh. Balbir Kumar Sibal	139	,,	B.Sc.
239.	239	13002	Sh. Jamana Lal Rathaur	138	M.P.	B.Sc.
240.	239	13751	Sh. Kulkarni Arun Narayan	138	M.S.	B.Sc.
241.	239	41665	Sh. Dhandhania Vishnu Kumar	138	W.B.	Engg.
242.	239	757	Km. Savita Gupta	138	Delhi	B.Sc.
243.	239	1943	Km. K. J. Kaur	138	,,	Pre-Med.
244.	239	1731	Sh. Arun Kumar Gambhir	138	,,	Engg.
245.	239	33757	Sh. Firoz Alam	138	U.P.	Inter Sc.
246.	239	34522	Km. Jayanti Kar	138	,,	Inter Sc.
247.	239	24015	Sh. Mahesh Dass	138	Punjab	Pre-Engg.
248.	248	13013	Sh. Nand Kishore Vyas	137	M.P.	B.Sc.
249.	248	15728	Km. Alaka Moreshwar Dikshit	137	M.S.	Pre-Med.
250.	248	22033	Sh. Niranjan Kavi	137	Orissa	Engg.
251.	248	41551	Km. Swapna Sarkar	137	W.B.	No reply
252.	248	41987	Sh. Prabir Kumar Basu	137	,,	Engg.
253.	248	20119	Km. N. Chandra Sekaran	137	Madras	B.Sc.

1	2	3	4	5	6	7
254.	248	2240	Sh. T. S. Jaya Kumar	137	A.P.	B.Sc.
255.	248	1842	Km. Neelam Madan	137	Delhi	Pre-Med.
256.	248	1638	Sh. Moti Lal Gohani	137	,,	Engg.
257.	248	30654	Sh. Soumitra Ballabh Biswas	137	U.P.	Inter Sc.
258.	248	35758	Sh. Krishnaswamy Rajhavan	137	,,	Engg.
259.	248	34533	Sh. Arvind Bhushan Modgil	137	,,	Not eligible
260.	260	45079	Sh. Jaswant Singh Panagariya	136	M.P.	B.Sc.
261.	260	1192	Sh. Khaidem Momon Singh	136	Manipur	B.Sc.
262.	260	41872	Sh. Gautam Ghosh	136	W.B.	Pre-Engg.
263.	260	41911	Sh. Rodney Vivian Halburton	136	,,	Applied Zoology
264.	260	42038	Sh. Pardip Kumar Mukerjee	136	,,	Engg.
265.	260	842	Sh. Harmit Singh	136	Delhi	Engg.
266.	260	849	Sh. V. B. Aggarwal	136	,,	B.Sc.
267.	260	734	Sh. S. Balshubramanian	136	Delhi	Under-age
268.	260	27678	Km. Kamlesh Kumari	136	Punjab	B.Sc.
269.	260	26052	Km. Saroj Nayyar	136	,,	B.Sc.
270.	260	23121	Km. Sushil Kumari	136	,,	Pre-Med.
271.	271	45082	Sh. Devendra Zaveri	135	M.P.	B.Sc.
272.	271	14026	Sh. Shaikh Khvaj Kabiroddin Abdul Rashid	135	M.S.	B.Sc.
273.	271	41726	Sh. Rudrajit Das Gupta	135	W.B.	Engg.
274.	271	1583	Sh. Rajendra Krishna	135	Delhi	Engg.
275.	271	900	Sh. Rajendra Gujral	135	,,	B.Sc.
276.	271	28638	Sh. Ashok Rastogi	135	Raj.	B.Sc.
277.	271	29088	Sh. Surya Parkash Ajmera	135	,,	B.Sc.
278.	271	1514	Sh. Naresh Chandra Sayal	135	Delhi	Engg.
279.	271	1547	Sh. Munshiwar Nath	135	,,	B.Sc.
280.	271	23447	Sh. Rana Gurcharn Singh	135	Punjab	Pre-Med.
281.	271	34304	Km. Bala Krishna Rao	135	U.P.	Inter Sc.
282.	271	39342	Km. Talat Mah.	135	,,	Inter Sc.
283.	283	12365	Sh. Bhupendra Shah	134	M.P.	Engg.
284.	283	10812	Sh. Nishikant Choubey	134	,,	Pre-Med.
285.	283	13729	Sh. Teli Motilal Totaram	134	M.S.	B.Sc.
286.	283	5857	Md. Ulfatt Ullah	134	Assam	B.Sc.
287.	283	19871	Km. R. Chitralekha	134	Madras	B.Sc.
288.	283	1598	Sh. Anil Kumar Mangal	134	Delhi	Engg.
289.	283	1633	Sh. Surendra Kohli	134	,,	Engg.
290.	283	838	Sh. Vinod Chandra	134	,,	Inter Sc. (M.S)
291.	283	909	Sh. Shiv Raj Sharma	134	,,	B.Sc.
292.	283	748	Sh. R. Raman	134	,,	Medical
293.	283	30312	Sh. Arjun Malhotra	134	U.P.	Not eligible
294.	283	34305	Km. Durga Banerjee	134	,,	Inter Sc.
295.	283	38153	Sh. Purushottam Narayan Bajpai	134	,,	Inter Sc.
296.	283	35835	Sh. Suhail Parvez	134	,,	Inter Sc.
297.	283	25348	Sh. Vir Kumar Narula	134	Punjab	Engg.
298.	283	26047	Km. Promila Saini	134	,,	B.Sc.

1	2	3	4	5	6	7
299.	299	12915	Km. Pratibha Sitaram Belapurkar	133	M.P.	B.Sc.
300.	299	49137	Sh. Mohan Laxman Janardan	133	M.S.	B.Sc.
301.	299	6581	Sh. Vishwa Bhushan Dhar	133	Bihar	B.Sc.
302.	299	20173	Sh. R. Partha Sarthy	133	Madras	B.Sc.
303.	299	19806	Sh. Ramesh Vasant Patwardhan	133	,,	Medical
304.	299	1098	Sh. D. Thiagarajan	133	Pondicherry	Medical
305.	299	769	Km. Manjula Subramaniam	133	Delhi	B.Sc.
306.	299	847	Sh. Trilok Raj Sud	133	Delhi	Engg.
307.	299	30316	Sh. Ravindra Kumar	133	U.P.	Not eligible
308.	299	31620	Sh. Ravindra Kumar	133	U.P.	Inter Sc.
309.	299	35771	Sh. Shyam Sunder Saxena	133	,,	Inter Sc.
310.	299	27690	Sh. Vijay Kumar Sethi	133	Punjab	B.Sc.
311.	299	31014	Sh. Shashi Prakash Sharma	133	U.P.	Inter Sc.
312.	312	10402	Sh. Ashok Kumar Billore	132	M.P.	B.Sc.
313.	312	13142	Miss Swati Dutta	132	,,	B.Sc.
314.	312	13776	Sh. Kulkarni P. K. Rao	132	M.S.	B.Sc.
315.	312	15702	Sh. Janardan Lalita Shanker Agnihotri	132	,,	B.Sc.
316.	312	47101	Sh. Subhashchandra Raghuveer Hernaja	132	Mysore	B.Sc.
317.	312	19805	Sh. Subramaniam Narayan	132	Madras	Engg.
318.	312	1829	Sh. T. N. Narsimhan	132	Delhi	Under-age
319.	312	1866	Km. Loveleen Sethi	132	,,	Pre-Med.
320.	312	1805	Miss Usha Bhan	132	,,	Under-age
321.	312	22997	Sh. Suresh Kumar Gupta	132	Punjab	B.Sc.
322.	312	27026	Sh. Madan Mohan Singh	132	,,	Pre-Engg.
323.	323	13045	Sh. Vishnu Swaroop Gupta	131	M.P.	Engg.
324.	323	13758	Sh. Talwalkar Anand Vishwanath	131	M.S.	B.Sc.
325.	323	22036	Sh. Mohanty Pradipta Chandra	131	Orissa	Engg.
326.	323	22486	Sh. Sudhakar Pradhan	131	,,	B.Sc.
327.	323	41561	Km. Ruby Chatterjee	131	W.B.	B.Sc.
328.	323	17661	Sh. R. Jayathirtha	131	Mysore	B.Sc.
329.	323	17018	Sh. N. Seetharama	131	,,	B.Sc.
330.	323	33306	Sh. Ravindra Tewari	131	U.P.	Inter Sc.
331.	323	35028	Sh. Swatanter Kumar Jain	131	U.P.	Inter Sc.
332.	323	34394	Sh. Somendra Partap Singh	131	U.P.	Inter Sc.
333.	323	27137	Sh. Parmjit Singh	131	Punjab	B.Sc.
334.	334	43740	Km. Indira Mitra	130	W.B.	B.Sc.
335.	334	19886	Sh. Vijay Sarathy Eashwar	130	Madras	B.Sc.
336.	334	1004	Sh. Kuvelker Sobhash Chandra	130	Goa	B.Sc.
337.	334	1851	Km. Aruna Naithani	130	Delhi	Pre-Med.
338.	334	20185	Km. T. Seetha	130	Madras	B.Sc.
339.	334	35770	Sh. Amitava Banerjee	130	U.P.	Not eligible
340.	334	35777	Sh. Mukesh Chander Laul	130	U.P.	Inter Sc.

1	2	3	4	5	6	7
341.	334	23248	Sh. Hans Raj Anand	130	Punjab	B.Sc.
342.	334	24504	Km. Usha Datta	130	,,	Pre-Med.
343.	343	8235	Sh. Oza Yogesh Kumar Babubhai	129	Gujrat	B.Sc.
344.	343	12238	Sh. Pratap Singh	129	M.P.	Engg.
345.	343	22527	Sh. Uday Sankar Roy	129	Orissa	B.Sc.
346.	343	5848	Km. Kamala Mahanta	129	Assam	B.Sc.
347.	343	17968	Sh. Vithaldas Bhikkappa Shenvi	129	Mysore	B.Sc.
348.	343	46769	Sh. M. Chandra Mouli	129	Mysore	B.Sc.
349.	343	29903	Sh. Parvindar Singh	129	Raj.	B.Sc.
350.	343	936	Sh. Jag Mohan Lall Khurana	129	Delhi	Engg.
351.	343	1661	Sh. Din Dayal Tahilyani	129	Delhi	Engg.
352.	343	33326	Sh. Harshavardhan Sinvhal	129	U.P.	Inter Sc.
353.	343	30620	Sh. Rakesh Kumar	129	U.P.	Inter Sc.
354.	343	22928	Sh. Manmohan Singh	129	Punjab	B.Sc.

	Number	Percentage
Boys	280	79·1
Girls	74	20·9
	N = 354	

APPENDIX VII (B)

MERIT LIST (CERTIFICATES OF MERIT)

These names have been arranged in order of merit. Only those will be considered for the final award who satisfy the conditions laid down by the Department of Science Education, National Council of Educational Research and Training, Delhi.

S. No.	*Rank*	*Roll No.*	*Name of the contestant*	*Marks obtained*	*State/territory from which appeared*
1.	2.	3.	4.	5.	6.
1.	355	6598	Sh. Guru Dev Sahai	128	Bihar
2.	355	1125	Sh. Brajalal Debnath	128	Tripura
3.	355	49132	Sh. Kameshwar Venkatram	128	M.S.
4.	358	41959	Sh. Khushrow K. Press	127	W.B.
5.	358	1763	Sh. Mukesh Kumar Jain	127	Delhi
6.	358	19259	Km. Krishna Kumari V. K.	127	Madras
7.	358	1646	Sh. Vanamali Mohan Das	127	Delhi
8.	358	844	Sh. Gulshan Rai Bajaj	127	Delhi
9.	358	8563	Km. Doshi,Priyamvade Umiyashanker	127	Gujrat
10.	358	10609	Sh. Nagendra Rao	127	M.P.
11.	358	13730	Km. Nalini Padamsinh Pardeshi	127	M.S.
12.	358	30304	Km. Pratibha Malhotra	127	U.P.
13.	358	30321	Sh. Sumanjit Chaudhry	127	U.P.
14.	358	34536	Sh. Lakshmendra Shanker Saxena	127	U.P.
15.	358	22703	Sh. Shyam Sunder Arora	127	Punjab
16.	358	24517	Sh. Surinder Kumar Khurana	127	,,
17.	371	41778	Sh. Jyoti Prakash Mitra	126	W.B.
18.	371	22528	Sh. Mohan Dass	126	Orissa
19.	371	1510	Sh. Harash Vardhan Maheshwary	126	Delhi
20.	371	20237	Sh. S. Ramanathan	126	Madras
21.	371	1865	Km. Asha Khanna	126	Delhi
22.	371	19873	Km. Joyee M. R. Poonaiya	126	Madras
23.	371	1843	Km. Sunanda Uberoi	126	Delhi
24.	371	10421	Sh. Sudhir Mehendra	126	M.P.
25.	371	11213	Sh. Devendra Singh Rai	126	,,
26.	371	12429	Sh. Jagdish Gokhale	126	,,
27.	371	14856	Sh. P. V. Pawar	216	M.

1	2	3	4	5	6	
28.	371	37730	Km. Shobha Agarwal		126	U.P.
29.	371	34229	Sh. Krishan Mohan Dheer		126	"
30.	371	34534	Sh. Syed Asraf Ali		126	"
31.	371	34562	Sh. Subroto Kumar Sanyal		126	"
32.	371	25562	Sh. Shayam Dass Bhatia		126	Punjab
33.	387	41875	Sh. Anupansu Kumar Ghosh		125	W.B.
34.	387	41969	Sh. V. K. Acharya		125	"
35.	387	41986	Sh. M. K. Bandyopadhyay		125	"
36.	387	42141	Sh. P. N. Ganguly		125	"
37.	387	7032	Syeed Irfan Ahmed		125	Bihar
38.	387	1349	Sh. Laimayum Dvrlav Sarma		125	Manipur
39.	387	15658	Sh Ashok Amrit Pattak		125	M.S.
40.	387	40095	Sh. Nirendra Kumar		125	U.P.
41.	387	26009	Sh. Mohinder Kumar		125	Punjab
42.	387	27055	Sh. Harbhajan Singh		125	"
43.	387	26345	Km. Meera Sachdev		125	"
44.	387	1482	Sh. Parakash Chand Rattan		125	H.P.
45.	399	41666	Sh. B. B. Kumar		124	W.B.
46.	399	472	Sh. Ashok Kumar Verma		124	Delhi
47.	399	20162	Km. D. Vijaya		124	Madras
48.	399	19217	Km. R. Vasantha		124	"
49.	399	48215	Sh. Flavian D'Souza Kamatha		124	Mysore
50.	399	15738	Sh. Vinay Kumar Dewan		124	M.S.
51.	399	30235	Sh. B. B. Sharma		124	U.P.
52.	399	35062	Km. Sudha Gupta		124	"
53.	399	36305	Sh. Pratap Devendra Singh		124	"
54.	399	39095	Sh. Rajendra Prakash Kapoor		124	"
55.	399	26354	Km. Usha Rani Vasishta		124	Punjab
56.	399	23433	Sh. Abhai Ram Maurya		124	"
57.	411	41538	Miss Krishna Ghosh		123	W.B.
58.	411	44254	Sh. P. C. Mahata		123	"
59.	411	7034	Md. Shamim		123	Bihar
60.	411	1925	Km. Saroj Bala		123	Delhi
61.	411	1509	Sh. Bhawneshwar Kumar Girdhar		123	Delhi
62.	411	17654	Sh. H. S. Neela Kanta Swamy		123	Mysore
63.	411	28926	Sh. Sita Ram Mittal		123	Raj.
64.	411	12362	Sh. Girish Kumar Verma		123	M.P.
65.	411	48008	Sh. Anand Shamrao Kate		123	M.S.
66.	411	13727	Sh. Kalal Madhukar Bhagwansa		123	"
67.	411	49102	Miss D. R. Raghunath		123	"
68.	411	27136	Sh. Parshotam Kumar		123	Punjab
69.	411	39366	Syaid Iqtedar Birjees Rizvi		123	U.P.
70.	411	34389	Sh. P. K. Sharma		123	"
71.	411	34471	Sh. V. K. Vohra		123	"
72.	426	41604	Sh. T. S. Bhattacharyya		122	W.B.

1	2	3	4	5	6
73.	426	43313	Sh. S. N. Choudhuri	122	W.B.
74.	426	707	Sh. Vishwa Nath	122	Delhi
75.	426	20103	Sh. Maria Pushpa Raj F. I.	122	Madras
76.	426	10850	Km. Jayashree Sen	122	M.P.
77.	426	15069	Km. T. L. Vishnu	122	M.S.
78.	426	13660	Km. S. C. Limaya	122	M.S.
79.	426	30602	Sh. Krishan Mohan Kshatry	122	U.P.
80.	426	30611	Sh. A. K. Ohri	122	"
81.	426	32217	Sh. Subban Khan	122	"
82.	426	35693	Sh. Sarvjeet Kalra	122	"
83.	426	39364	Sh. Charan Amulya	122	"
84.	426	22975	Sh. Raman Kumar	122	Punjab
85.	426	25417	Sh. Jai Prakash	122	"
86.	440	41670	Sh. Ashoke Boral	121	W.B.
87.	440	42129	Sh. S. K. Mondal	121	"
88.	440	7095	Sh. Rajeva Ranjan	121	Bihar
89.	440	5923	Sh. A. K. Mitra	121	Assam
90.	440	1905	Km. Narinder	121	Delhi
91.	440	17822	Sh. S. P. Shridhar	121	Mysore
92.	440	19252	Km. Neeraja Dasarathi	121	Madras
93.	440	2260	Sh. V. N. Mohan Rao	121	A.P.
94.	440	28906	Sh. Vishnu Prakash Gurg	121	Raj.
95.	440	1048	Sh. J. Iroudayaradjou	121	Pondicherry
96.	440	10599	Sh. R. K. Anand	121	M.P.
97.	440	13714	Sh. K. S. Avadhut	121	M.S.
98.	440	48879	Km. J. Kocher	121	"
99.	440	36329	Sh. Maqbool Ahmed	121	U.P.
100.	440	25188	Km. Sudesh Garg	121	Punjab
101.	440	27161	Sh. Harinarain Singh Minhas	121	"
102.	440	27677	Km. Renu Saigal	121	"
103.	440	23445	Sh. Nain Singh Chauhan	121	"
104.	458	41958	Sh. S. K. Ghosh	120	W.B.
105.	458	43188	Sh. A. B. Dutta	120	"
106.	458	44251	Sh. K. K. Roy	120	"
107.	458	1348	Sh. Thokchom Meinya Singh	120	Manipur
108.	458	933	Sh. Surender Kumar	120	Delhi
109.	458	724	Sh. Jagdish Chandra Garg	120	"
110.	458	1506	Sh. Gopal Krishan Jindal	120	"
111.	458	20194	Km. S. Shantha	120	Madras
112.	458	19212	Km. V. Vijaya	120	"
113.	458	1032	Sh. Vasudev Anand Umachigi	120	Pondicherry
114.	458	29085	Sh. Bherulal Sainy	120	Raj.
115.	458	11265	Km. Jayashri Mitra	120	M.P.
116.	458	10662	Sh. V. K. V. Gijare	120	"
117.	458	15701	Sh. K. N. Verma	120	M.S.
118.	458	35753	Sh. Anurag Goel	120	U.P.
119.	458	36031	Sh. Krishna Swamy Srivnivasan	120	"

1	2	3	4	5	6
120.	458	34360	Sh. Pradeep Kumar	120	U.P.
121.	458	22891	Sh. Tarsem Kumar	120	Punjab
122.	458	27037	Sh. Darshan Lal Gupta	120	"
123.	458	26323	Km. Savita Krishen	120	"
124.	478	41777	Sh. T. L. Basak	119	W.B.
125.	478	41910	Sh. Mahadevan Harharan	119	"
126.	478	6597	Sh. Jawaid Imam	119	Bihar
127.	478	19907	Sh. Ramaswami Seshasayee	119	Madras
128.	478	4444	Sh. Singh Ampalli Lakshmi Narasimham	119	A.P.
129.	478	29089	Sh. Suraj Mal Nama	119	Raj.
130.	478	45028	Sh. Suresh Chandra	119	M.P.
131.	478	12413	Sh. Motilal Dalal	119	"
132.	478	12103	Sh. Ajit Kumar Agarwal	119	"
133.	478	34261	Sh. Upendra Singh Rohatgi	119	U.P.
134.	478	36284	Sh. Jamal Ahmed Jafri	119	"
135.	489	1651	Sh. Devendra Pal Garg	118	Delhi
136.	489	1657	Sh. Surinder Mohan	118	"
137.	489	1703	Sh. Raj Kumar Laul	118	"
138.	489	1926	Km. Veena	118	"
139.	489	1756	Sh. Ashok Bhatia	118	"
140.	489	19042	Sh. S. Meenakshi Sundaram	118	Madras
141.	489	20163	Km. N. Lalitta	118	"
142.	489	4591	Sh. V. C. Ananthan	118	A.P.
143.	489	1001	Sh. Karmali Narendra Damodar	118	Goa
144.	489	1611	Sh. Devashis Guha	118	Delhi
145.	489	10612	Miss Prabha Krishna Swamy	118	M.P.
146.	489	10901	Sh. Arun Kumar Nath	118	"
147.	489	48009	Sh. Sharad Prabhakar Raje	118	M.S.
148.	489	14006	Sh. Nadgauda Nagappa Mahadevappa	118	M.S.
149.	489	30469	Sh. Mohendra Singh Sandhu	118	U.P.
150.	489	30536	Km. Ranjna Tyagi	118	"
151.	489	27693	Sh. Yashpal Singh Arora	118	Punjab
152.	506	46087	Sh. Swadhin Ram	117	W.B.
153.	506	7614	Sh. Anurag Das	117	Bihar
154.	506	1712	Sh. Rakesh Kumar Khosla	117	Delhi
155.	506	1761	Sh. Jagateshwar Singh Reinew	117	"
156.	506	46758	Km. Shanta Kumari S.	117	Mysore
157.	506	19243	Km. G. Vanitha Kumari	117	Madras
158.	506	1099	Sh. V. Srivatsan	117	Pondicherry
159.	506	45605	Km. Pillutla Kameshwari	117	A.P.
160.	506	770	Km. Bashabi Sen	117	Delhi
161.	506	872	Km. A.N.S. Lalitha	117	"
162.	506	29090	Sh. Brij Raj Kishore Sindhava	117	Raj.

1	2	3	4	5	6
163.	506	8019	Sh. Modi Kiranchandra Jamnadas	117	Gujrat
164.	506	8111	Sh. Patel Bhasker Bhaichiman Lal	117	"
165.	506	10409	Sh. Rajeev Lal	117	M.P.
166.	506	12109	Sh. Samrath Mal Mehta	117	"
167.	506	15671	Sh. Ajeet Keshaorao Kurvey	117	M.S.
168.	506	15762	Sh. Jayant Dattatraya Hari Das	117	"
169.	506	34353	Sh. Subhash Kacker	117	U.P.
170.	506	34400	Sh. Rakesh Mehta	117	"
171.	506	26030	Sh. Vijendra Kumar	117	Punjab
172.	506	47305	Sh. Vinod Kumar Gupta	117	"
173.	506	27601	Sh. Ajmer Singh	117	"
174.	506	27675	Km. Swatantar	117	"
175.	529	7596	Sh. Anil Kumar Dubey	116	Bihar
176.	529	46759	Km. Lakshmi Nageswaran	116	Mysore
177.	529	17402	Sh. Srinivasan G. K.	116	Mysore
178.	529	20109	Sh. K. C. V. Ramanujam	116	Madras
179.	529	20191	Sh. N. V. Sripathy	116	"
180.	529	28558	Sh. Ramesh Chander Suthar	116	Raj.
181.	529	49139	Sh. K. N. Joseph	116	M.S.
182.	529	37420	Sh. Praphulla Rai	116	U.P.
183.	529	22983	Sh. Manohar Lal Sharma	116	Punjab
184.	529	27164	Sh. Yajneshwar Kumar	116	"
185.	529	27689	Sh. Ram Ajmani	116	"
186.	529	27626	Sh. Prem Sagar	116	"

	Number	Percentage
Boys	148	79·6
Girls	38	20·4

N = 186

APPENDIX VIII

ANALYSIS OF THE MERIT LIST, TAKING SLABS OF 50 RANKS IN SEVEN GROUPS (IN ORDER OF MERIT) TO INDICATE THE EDUCATIONAL COURSES OPTED BY THE AWARDEES.

Courses opted	RANK BANDS							Total	Percentage	
	1—50	51—100	101—150	151—200	201—250	251—300	301—354			
(1)	(2)							(3)	(4)	
1. B.Sc.	31	23	20	28	30	28	37	197	55.65%	64.97%
2. Pre-Med.	3	5	4	4	3	4	3	26	7.34%	
3. Pre-Engineering	—	—	1	2	2	1	1	7	1.98%	
4. B.A.	—	1	—	—	—	—	—	1	0.28%	
5. Medical	—	—	—	1	1	1	2	5	1.41%	24.86%
6. Engineering and Technology	12	16	18	8	10	12	7	83	23.45%	
7. Under-age	—	—	—	1	—	1	2	4	1.13%	
8. Not eligible	1	3	5	3	1	2	2	17	4.80%	
9. No reply	2	2	—	2	3	1	—	10	2.83%	
10. Not joining	—	—	2	1	—	—	—	3	0.85%	
11. Joined foreign university in Basic Sciences	1	—	—	—	—	—	—	1	0.28%	
Total	50	50	50	50	50	50	54	354	100·00%	

	Top 100 Students	Middle 100 students	Last 100 students
B.Sc. and allied courses	— 63%	59%	68%
Engineering and Medical ,,	— 28%	27%	24%
Misc.-not applicable ,,	— 9%	14%	8%
	100%	100%	100%

APPENDIX IX

STATEWISE DISTRIBUTION OF THE CONTESTANTS AND THE AWARDEES (FIGURES AT A GLANCE)

S.No.	State/Territory	No. appeared at the test	No. called for interview	Selection ratio statewise	No. of awardees offerred scholarship	Selecion ratio statewise	Distribution of awardees statewise	No. of awardees for certificate of merit	Selection ratio statewise	Distribution of awardees statewise
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1.	Andhra Pradesh	447	40	9%	3	0.7%	0.85%	4	0.9%	2.15%
2.	Assam	89	25	28%	8	9%	2.26%	1	1.1%	0.54%
3.	Bihar	222	28	13%	4	2%	1.13%	7	3.2%	3.76%
4.	Gujrat	131	20	15%	7	6%	2.00%	3	2.3%	1.61%
5.	Madhya Pradesh	894	87	10%	27	3%	7.62%	16	1.8%	8.60%
6.	Madras	186	92	49%	14	8%	3.95%	15	8.5%	8.07%
7.	Maharashtra	326	92	28%	37	11%	10.45%	18	5.5%	9.68%
8.	Mysore	224	57	25%	11	5%	3.11%	6	2.7%	3.21%
9.	Orissa	94	20	21%	7	7%	2.00%	1	1.0%	0.54%
10.	Punjab	579	166	29%	39	7%	11.02%	27	4.7%	14.52%
11.	Rajasthan	309	20	6%	4	1%	1.13%	6	1.9%	3.21%
12.	Uttar Pradesh	2398	151	6%	49	2%	13.81%	31	1.3%	16.68%
13.	West Bengal	500	121	24%	36	7%	10.17%	19	3.8%	10.22%
14.	Delhi	366	212	56%	104	28%	29.38%	24	6.5%	12.91%
15.	Himachal Pradesh	35	2	6%	—	0%	—	1	2.9%	0.54%
16.	Manipur	13	11	85%	1	8%	0.28%	2	15.4%	1.07%
17.	Tripura	19	3	16%	—	0%	—	1	5.3%	0.54%
18.	Goa	03	3	100%	1	33%	0.28%	1	33.3%	0.54%
19.	Pondicherry	59	22	37%	2	3%	0.56%	3	5.0%	1.61%
		6894	1172		354		100.00%	186		100.00%

APPENDIX X

MEASURES OF CENTRAL TENDENCY AND VARIABILITY OF SCORES INTERVIEW-BOARD WISE (ZONAL)

		Name of the Board						
		Gauhati	Bangalore	Dehradun	Delhi	Calcutta	Ahmedabad	Pooled
Name of the Test	*Statistic*	*I* M_1	*II* M_2	*III* M_3	*IV* M_4	*V* M_5	*VI* M_6	*VII*
Science Aptitude Test	Mean	59.90	60.50	58.80	70.20	63.08	57.23	61.72
	S.D.	13.03	16.28	16.50	18.46	16.84	17.97	17.71
	$S.E_m$	2.14	1.30	0.93	1.21	1.47	1.28	0.53
	$S.E_\sigma$	1.51	0.92	0.65	0.86	1.04	0.90	0.37
Essay Paper	Mean	26.78	26.05	26.00	26.21	27.21	30.15	26.95
	S.D.	6.41	8.30	4.50	7.12	8.61	7.78	7.19
	$S.E_m$	1.05	0.57	0.25	0.47	0.75	0.55	0.22
	$S.E\sigma$	0.75	0.41	0.18	0.33	0.53	0.39	0.15
Project Report	Mean	7.95	9.10	9.71	9.22	11.20	10.62	9.76
	S.D.	3.69	2.65	3.12	3.84	3.11	2.99	3.29
	$S.E_m$	0.66	0.19	0.18	0.25	0.29	0.22	0.10
	$S.E_\sigma$	0.47	0.13	0.13	0.18	0.21	0.16	0.07
Interview	Mean	24.82	18.00	29.00	24.35	25.53	39.61	26.54
	S.D.	13.98	9.50	14.00	11.44	11.96	12.56	15.65
	$S.E_m$	2.64	1.48	0.87	0.79	1.12	1.10	0.52
	$S.E_\sigma$	1.87	1.65	0.61	0.56	0.79	0.78	0.37
Aggregate Score	Mean	111.26	109.50	110.50	128.91	122.47	120.92	117.38
	S.D.	22.79	22.50	18.30	36.45	28.28	29.31	27.44
	$S.E_m$	3.75	1.57	0.74	2.39	2.46	2.09	0.82
	$S.E\sigma$	2.65	1.11	0.53	1.69	1.74	1.47	0.58

(B) FREQUENCY DISTRIBUTIONS

(i) FREQUENCY DISTRIBUTION OF SCORES ON "SCIENCE APTITUDE TEST"

	Name of the Board						
	Gauhati Board	*Bangalore Board*	*Dehradun Board*	*Delhi Board*	*Calcutta Board*	*Ahmedabad Board*	*Grand Total*
C.I.	I	II	III	IV	V	VI	VII
140-149	—	—	—	—	—	—	—
130-139	—	1	—	—	—	—	1
120-129	—	0	—	2	—	1	3
110-119	—	1	2	2	2	0	7
100-109	—	1	5	12	1	5	24
90- 99	1	10	10	17	6	10	54
80- 89	3	8	15	34	9	7	76
70- 79	4	23	28	43	24	19	141
60- 69	7	39	58	35	25	26	190
50- 59	16	66	87	56	31	51	307
40- 49	4	54	94	26	27	57	262
30- 39	2	7	20	5	7	20	61
20- 29	—	1	—	—	—	2	3
Total	37	211	319	232	132	198	1129

(ii) FREQUENCY DISTRIBUTION OF SCORES ON "ESSAY PAPER"

	Name of the Board						
C.I.	*Gauhati Board*	*Bangalore Board*	*Dehradun Board*	*Delhi Board*	*Calcutta Board*	*Ahmedabad Board*	*Grand Total*
45-49	—	—	—	—	—	1	1
40-44	—	2	2	—	5	11	20
35-39	6	17	26	22	19	37	127
30-34	3	30	55	33	25	55	201
25-29	9	69	105	70	32	41	326
20-24	15	54	51	57	23	34	234
15-19	3	29	49	47	14	13	155
10-14	1	6	22	3	9	3	44
5- 9	—	2	8	—	4	3	17
0- 4	—	1	1	—	1	—	3
Total	37	210	319	232	132	198	1128

(iii) FREQUENCY DISTRIBUTION OF SCORES ON "PROJECT REPORT"

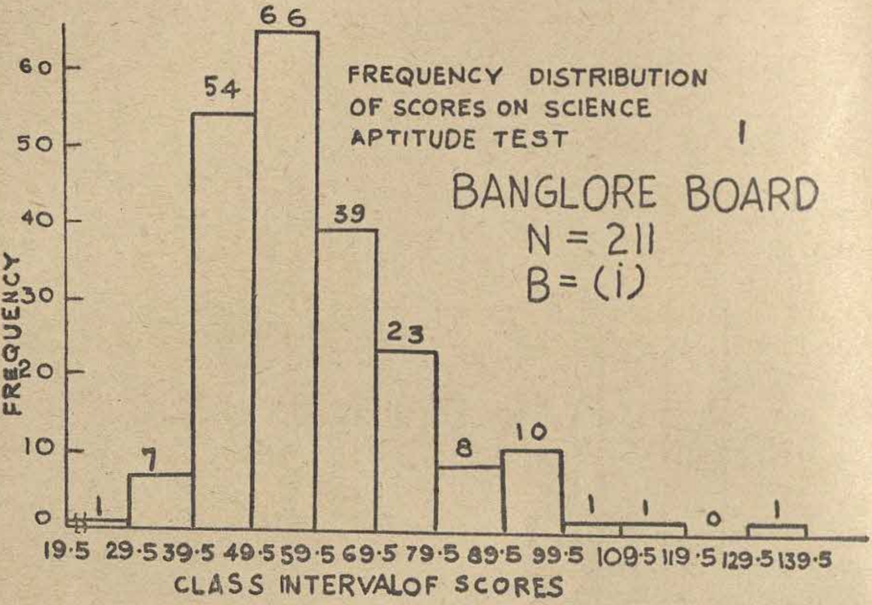
	Name of the Board						
	Gauhati Board	Bangalore Board	Dehradun Board	Delhi Board	Calcutta Board	Ahmedabad Board	Grand Total
C.I.	I	II	III	IV	V	VI	VII
23-24	—	—	—	1	—	—	1
21-22	—	—	2	0	—	—	2
19-20	—	2	1	3	2	—	8
17-18	1	1	4	7	2	2	17
15-16	1	5	12	17	16	23	74
13-14	2	9	34	16	19	27	107
11-12	2	22	53	23	18	33	151
9-10	5	67	80	53	38	41	284
7- 8	10	56	72	41	14	45	238
5- 6	5	22	35	59	4	9	134
3- 4	3	3	5	7	1	—	19
1- 2	2	1	1	2	—	—	6
Total	31	188	299	229	114	180	1041

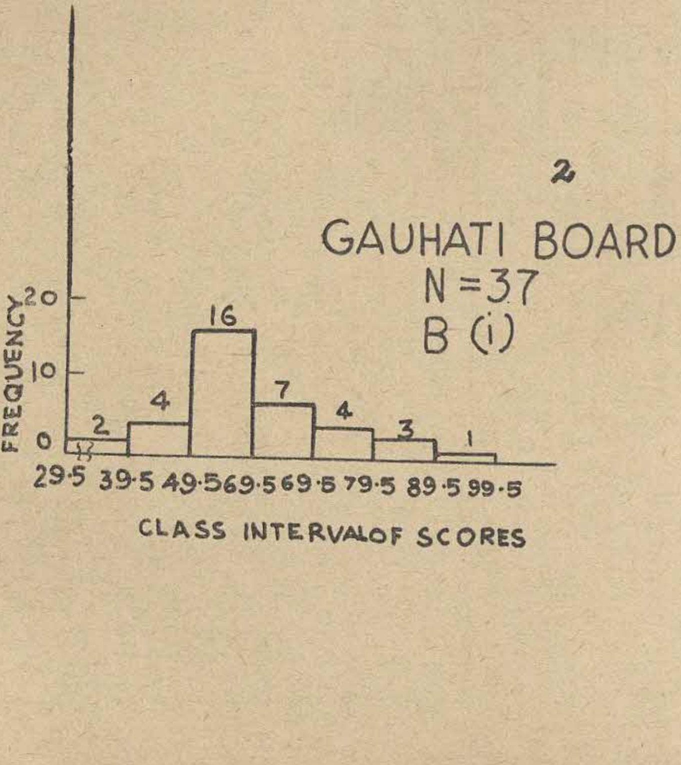
(iv) FREQUENCY DISTRIBUTION OF SCORES ON "INTERVIEW"

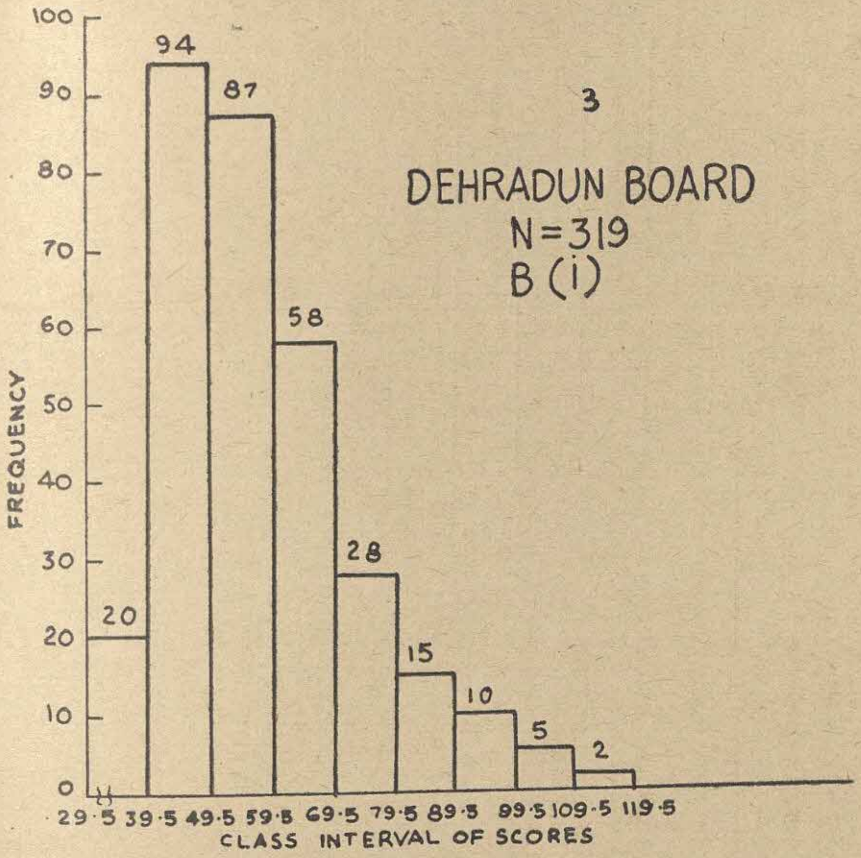
	Name of the Board						
	Gauhati Board	Bangalore Board	Dehradun Board	Delhi Board	Calcutta Board	Ahmedabad Board	Grand Total
C.I.	I	II	III	IV	V	VI	VII
60-64	—	—	7	2	2	4	15
55-59	—	3	10	2	3	3	21
50-54	2	0	11	4	2	6	25
45-49	4	2	13	3	5	12	39
40-44	1	4	16	4	5	9	39
35-39	1	4	20	21	14	20	80
30-34	3	1	38	22	10	20	94
25-29	2	11	34	22	15	16	100
20-24	2	13	29	39	22	19	124
15-19	6	43	34	40	27	15	165
10-14	7	82	49	39	9	4	190
5- 9	—	—	—	13	—	2	15
Total	28	163	261	211	114	130	907

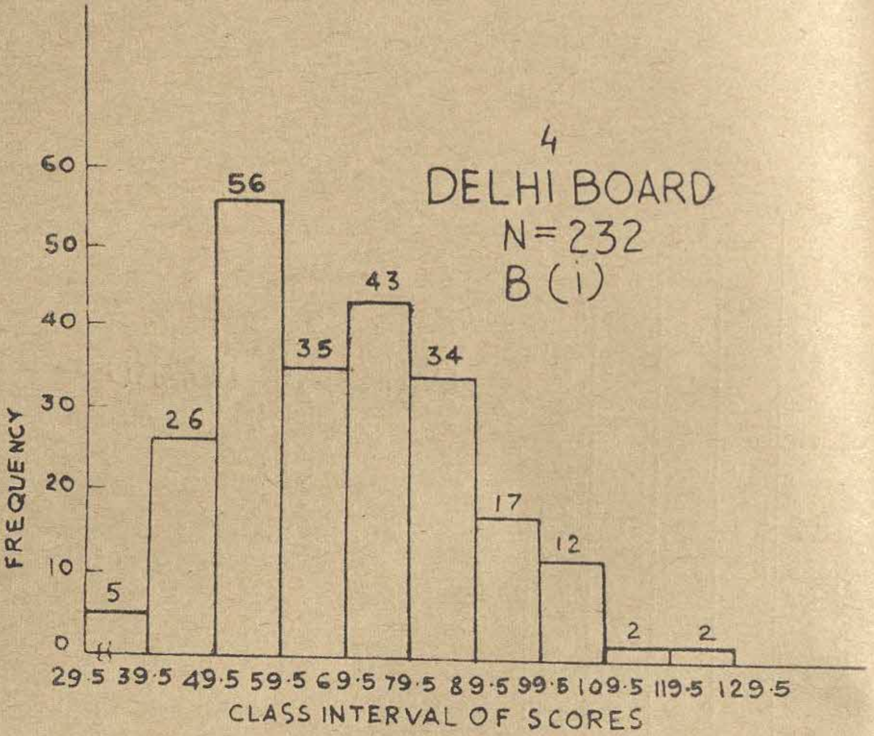
(v) FREQUENCY DISTRIBUTION OF COMPOSITE SCORES

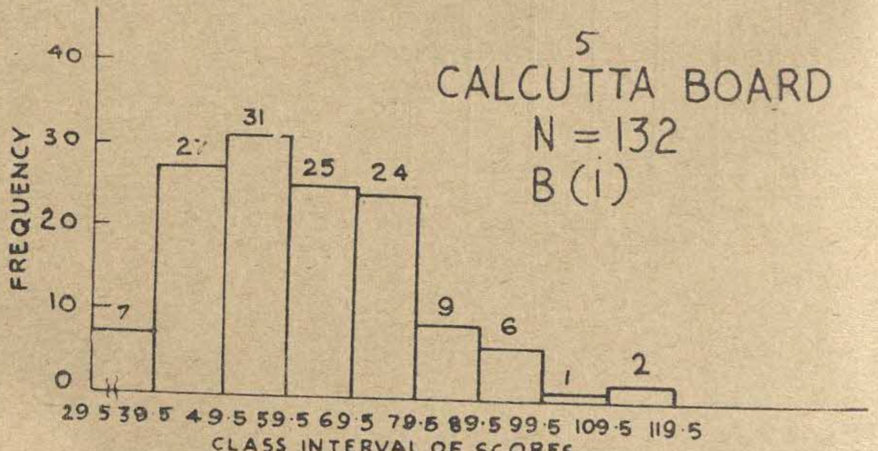
C.I.	*Name of the Board* *Gauhati Board I*	*Bangalore Board II*	*Dehradun Board III*	*Delhi Board IV*	*Calcutta Board V*	*Ahmedabad Board VI*	*Grand Total VII*
240-249	—	—	—	1	—	—	1
230-239	—	—	—	0	—	1	1
220-229	—	—	—	0	1	0	1
210-219	—	1	—	2	0	0	3
200-209	—	1	—	0	1	1	3
190-199	—	1	2	4	0	1	8
180-189	—	2	5	5	1	4	17
170-179	—	1	1	6	5	8	21
160-169	1	2	6	14	6	3	32
150-159	1	0	12	23	8	12	56
140-149	4	6	23	19	8	19	79
130-139	2	16	36	30	15	20	119
120-129	5	17	47	17	20	25	131
110-119	4	31	53	38	17	33	176
100-109	6	39	51	42	16	19	173
90- 99	8	54	43	20	23	19	167
80- 89	4	27	33	5	5	26	100
70- 79	2	8	7	6	5	7	35
60- 69	—	—	—	—	1	—	1
Total	37	206	319	232	132	198	1124

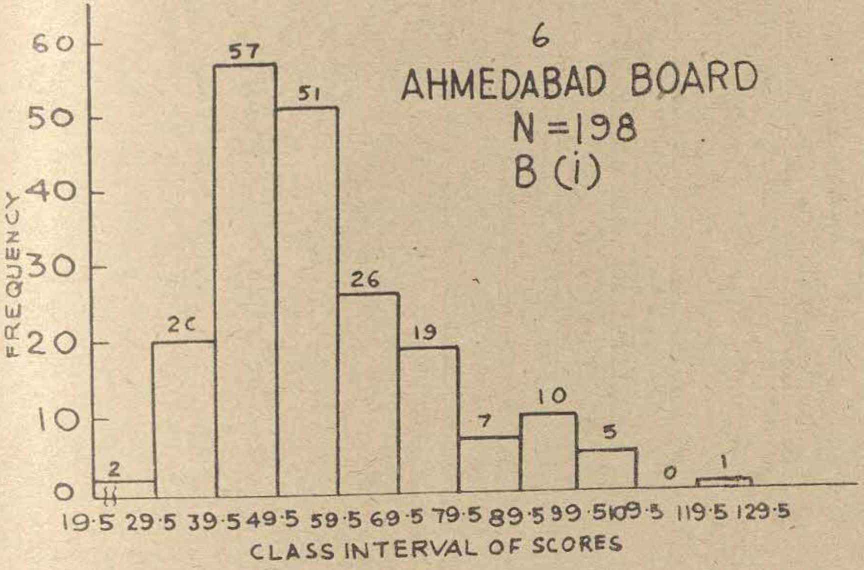

FREQUENCY DISTRIBUTION OF SCORES ON SCIENCE APTITUDE TEST
1
BANGLORE BOARD
N = 211
B = (i)
FREQUENCY
0
10
20
30
40
50
60
1
7
54
66
39
23
8
10
1
1
0
1
19·5
29·5
39·5
49·5
59·5
69·5
79·5
89·5
99·5
109·5
119·5
129·5
139·5
CLASS INTERVALOF SCORES


2
GAUHATI BOARD
N = 37
B (i)
FREQUENCY
0
10
20
2
4
16
7
4
3
1
29·5
39·5
49·5
69·5
69·5
79·5
89·5
99·5
CLASS INTERVALOF SCORES


3
DEHRADUN BOARD
N=319
B (i)
FREQUENCY
100
90
80
70
60
50
40
30
20
10
0
94
87
58
28
20
15
10
5
2
29·5
39·5
49·5
59·5
69·5
79·5
89·5
99·5
109·5
119·5
CLASS INTERVAL OF SCORES


4
DELHI BOARD
N=232
B (i)
FREQUENCY
0
10
20
30
40
50
60
5
26
56
35
43
34
17
12
2
2
29.5
39.5
49.5
59.5
69.5
79.5
89.5
99.5
109.5
119.5
129.5
CLASS INTERVAL OF SCORES


5
CALCUTTA BOARD
N = 132
B (1)
FREQUENCY
0
10
20
30
40
7
27
31
25
24
9
6
1
2
29.5
39.5
49.5
59.5
69.5
79.5
89.5
99.5
109.5
119.5
CLASS INTERVAL OF SCORES


6
AHMEDABAD BOARD
N = 198
B (i)
FREQUENCY
0
10
20
30
40
50
60
2
20
57
51
26
19
7
10
5
0
1
19·5
29·5
39·5
49·5
59·5
69·5
79·5
89·5
99·5
109·5
119·5
129·5
CLASS INTERVAL OF SCORES

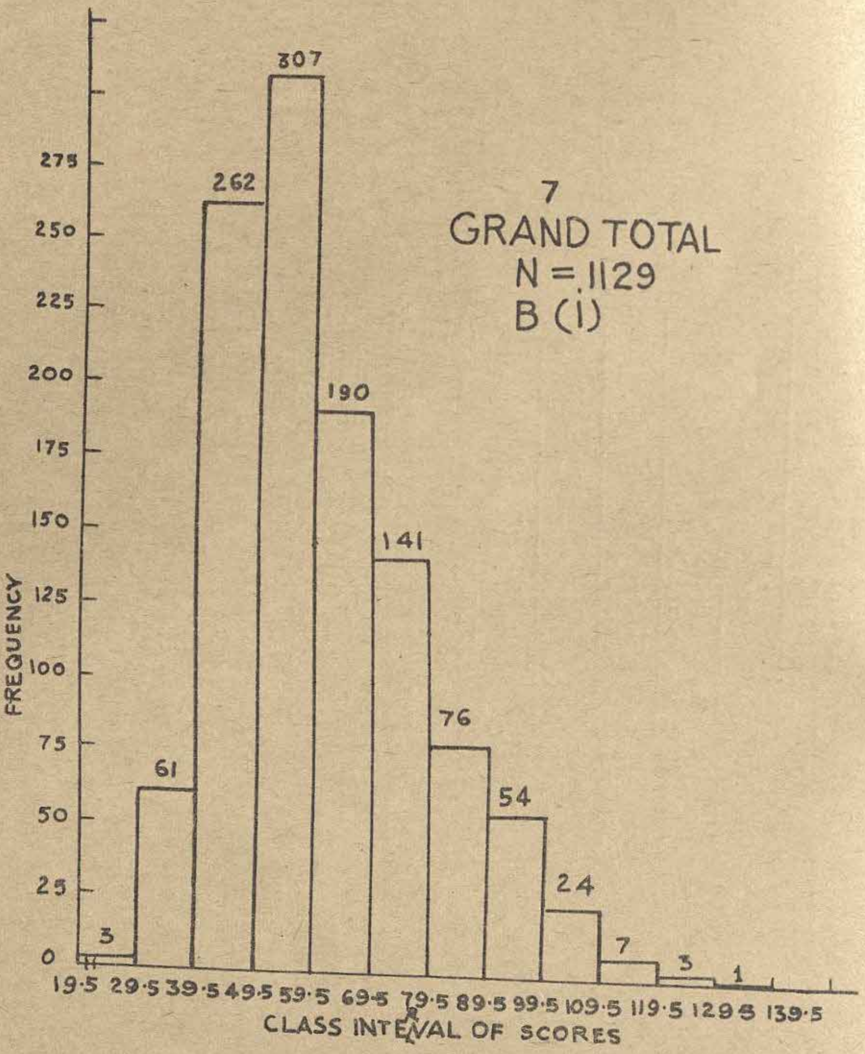
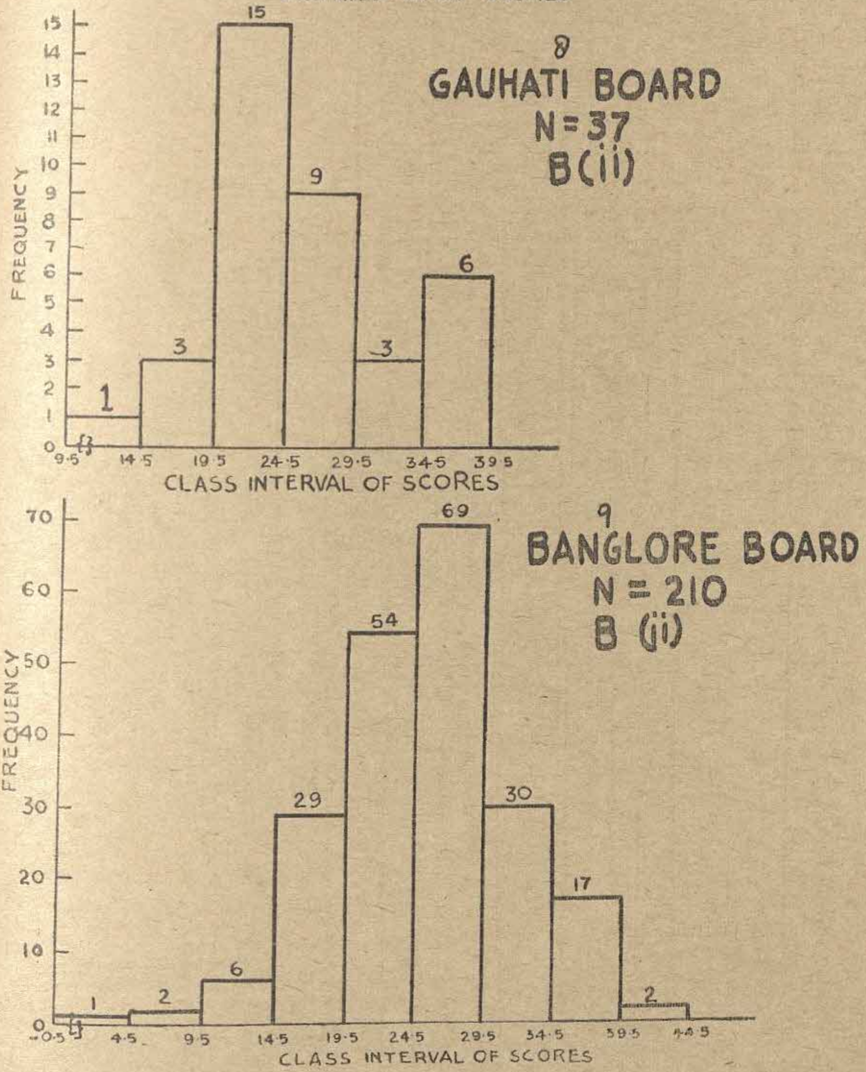
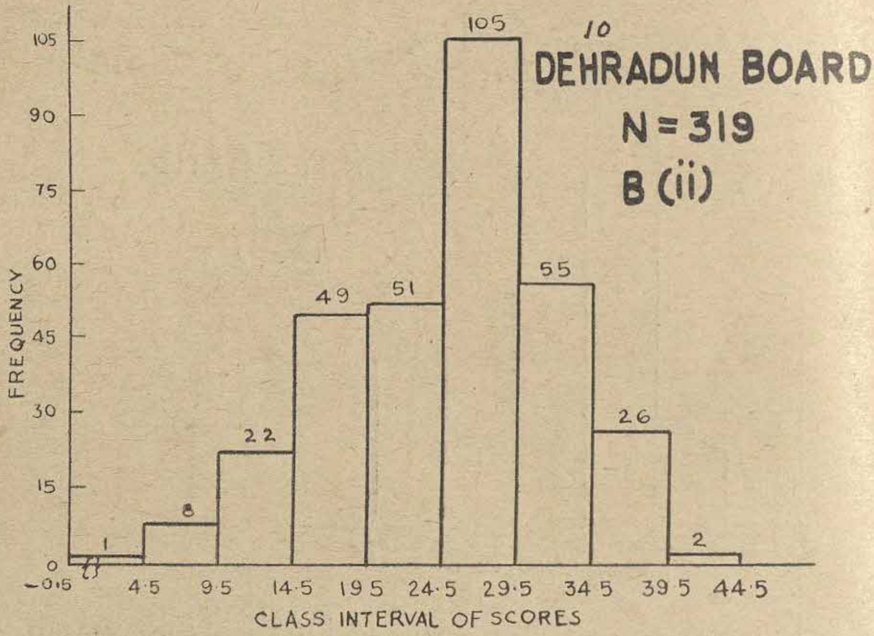
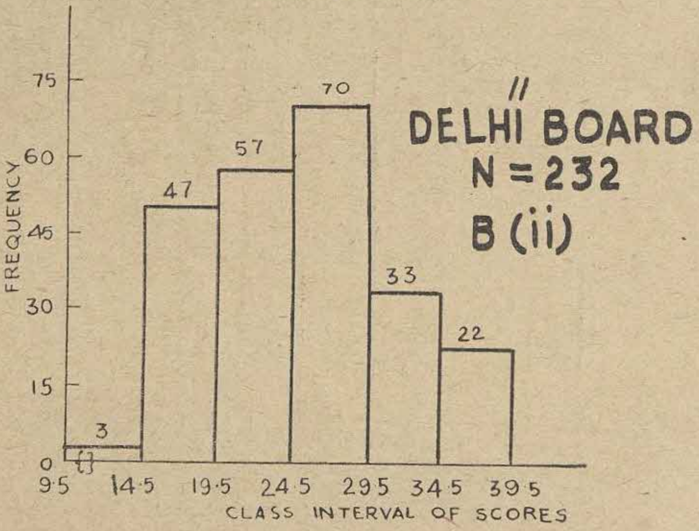
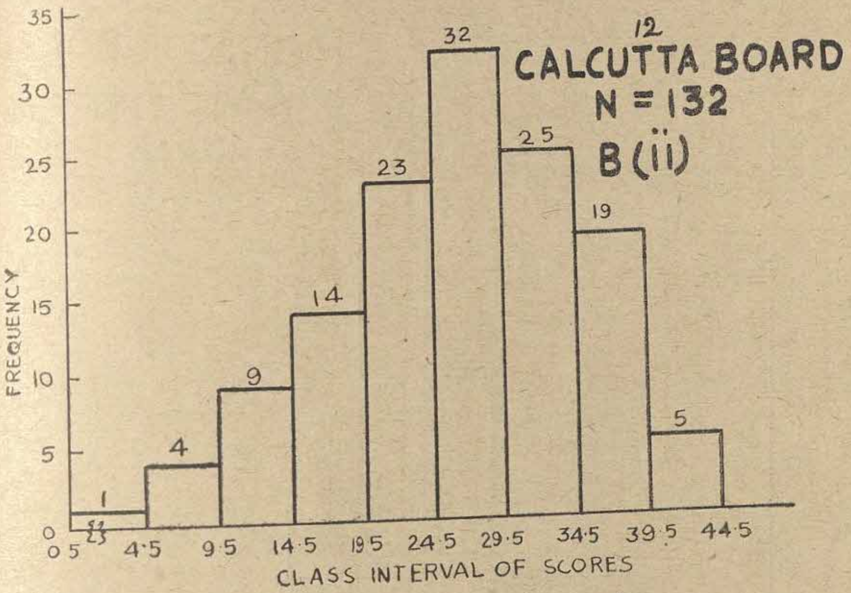

7
GRAND TOTAL
N = 1129
B (I)
FREQUENCY
0
25
50
75
100
125
150
175
200
225
250
275
3
61
262
307
190
141
76
54
24
7
3
1
19·5
29·5
39·5
49·5
59·5
69·5
79·5
89·5
99·5
109·5
119·5
129·5
139·5
CLASS INTERVAL OF SCORES

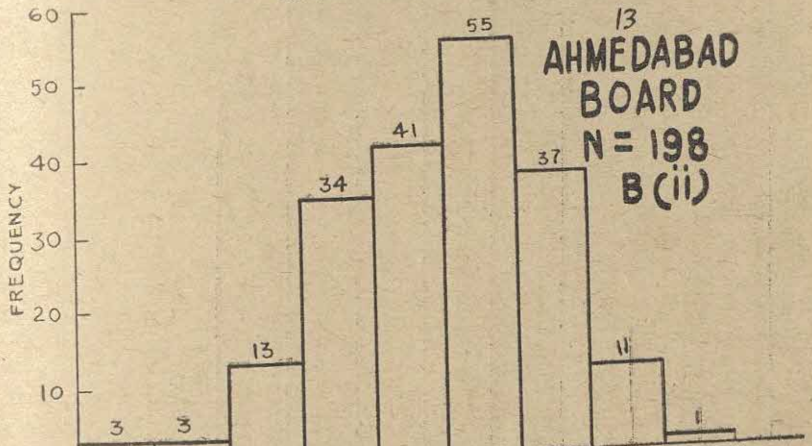
TABLE (ii) THE HISTOGRAMS SHOWING THE FREQUENCY DISTRIBUTION OF SCORES

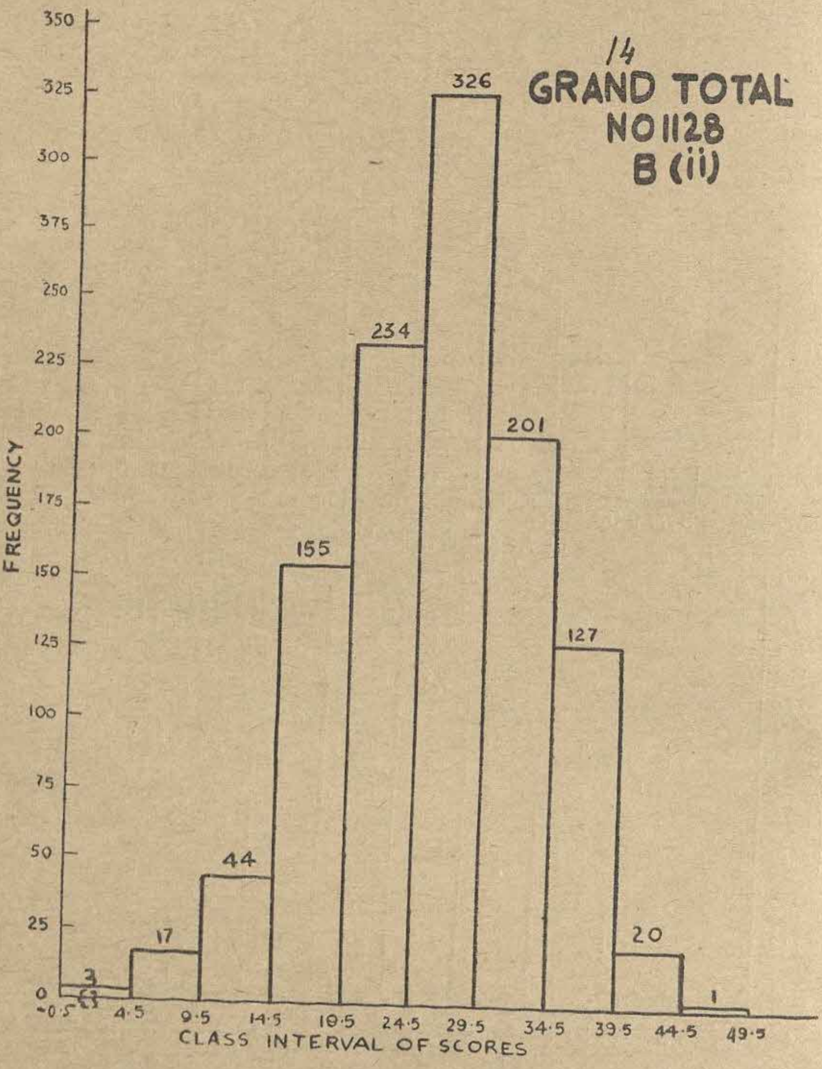



10
DEHRADUN BOARD
N = 319
B (ii)
FREQUENCY
105
90
75
60
45
30
15
0
1
8
22
49
51
105
55
26
2
−0.5
4·5
9·5
14·5
19·5
24·5
29·5
34·5
39·5
44·5
CLASS INTERVAL OF SCORES

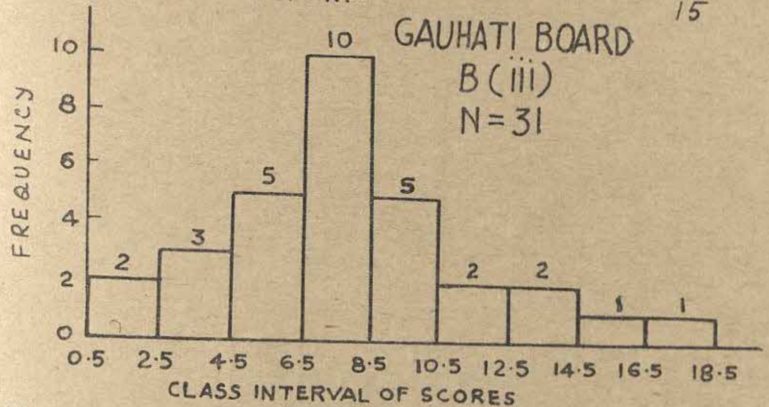

11
DELHI BOARD
N = 232
B (ii)
FREQUENCY
75
60
45
30
15
0
3
47
57
70
33
22
9·5
14·5
19·5
24·5
29·5
34·5
39·5
CLASS INTERVAL OF SCORES

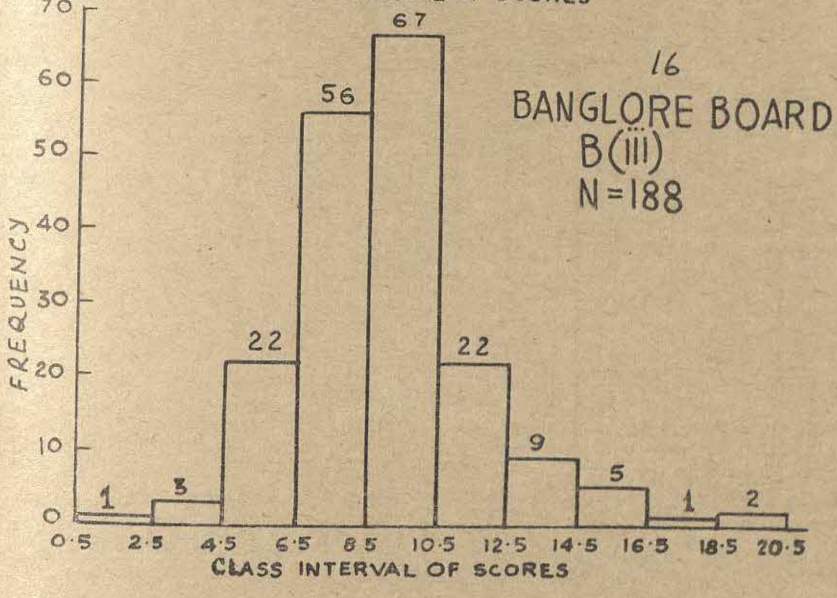

12
CALCUTTA BOARD
N = 132
B (ii)
FREQUENCY
35
30
25
20
15
10
5
0
1
4
9
14
23
32
25
19
5
0 5
4·5
9·5
14·5
19·5
24·5
29·5
34·5
39·5
44·5
CLASS INTERVAL OF SCORES

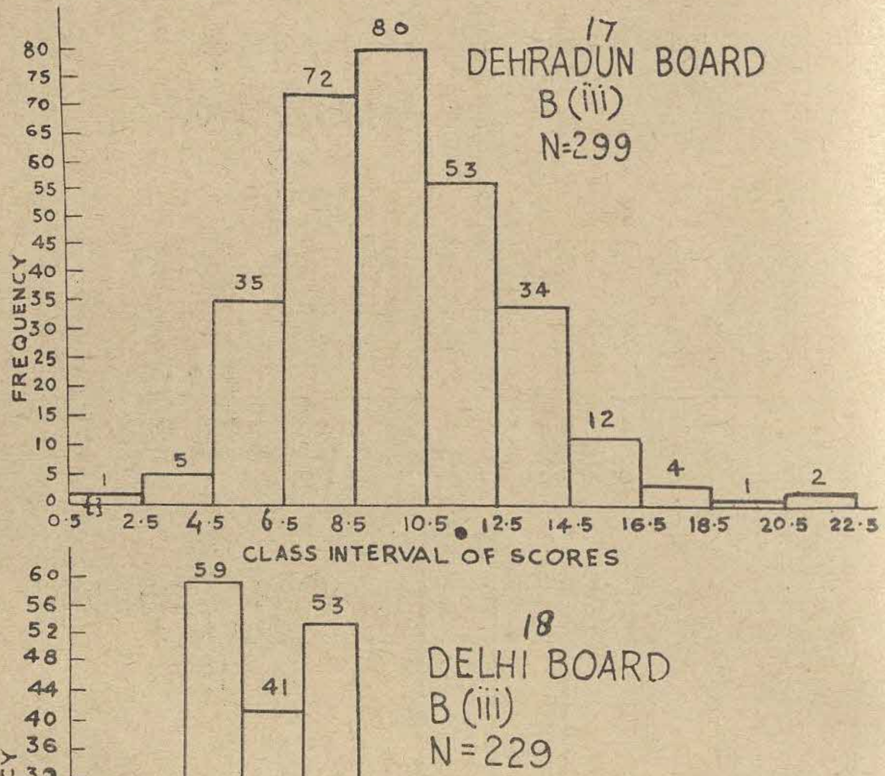

13
AHMEDABAD
BOARD
N = 198
B (ii)
FREQUENCY
60
50
40
30
20
10
0
3
3
13
34
41
55
37
11
1
4 5
9·5
14·5
19·5
24·5
29 5
34 5
39 5
44·5
49·5
CLASS INTERVAL OF SCORES

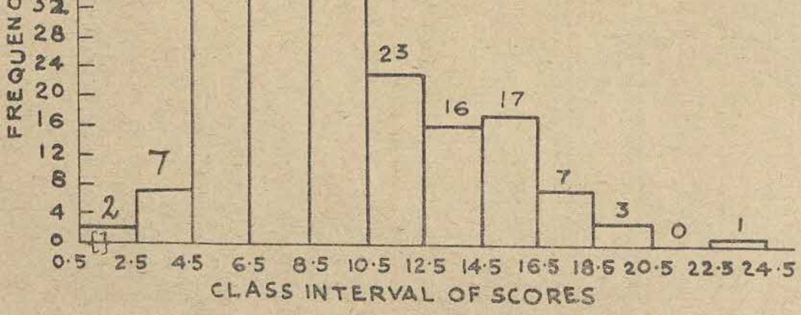

14
GRAND TOTAL
NO 1128
B (ii)
FREQUENCY
350
325
300
375
250
225
200
175
150
125
100
75
50
25
0
3
17
44
155
234
326
201
127
20
1
-0·5
4·5
9·5
14·5
18·5
24·5
29·5
34·5
39·5
44·5
49·5
CLASS INTERVAL OF SCORES

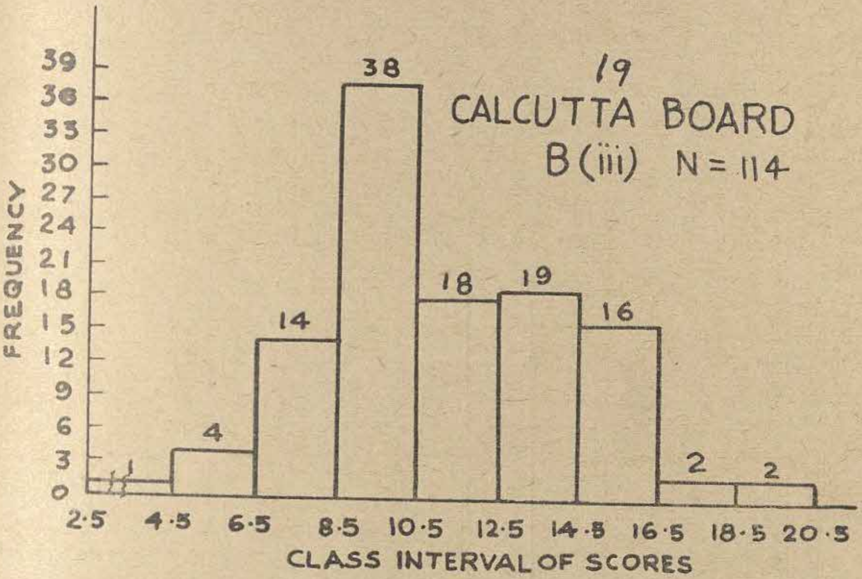
FREQUENCY DISTRIBUTION OF SCORES ON PROJECT REPORT

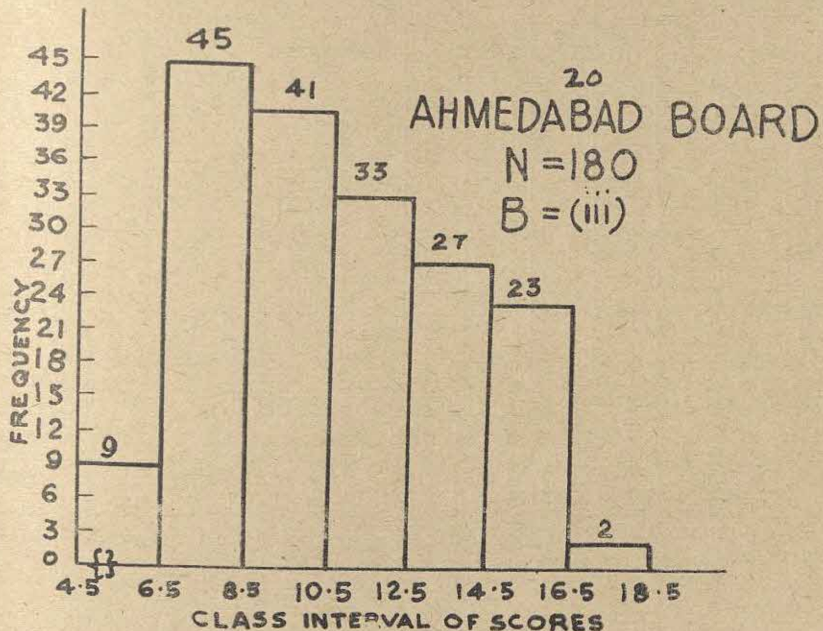





17
DEHRADUN BOARD
B (iii)
N=299
FREQUENCY
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
1
5
35
72
80
53
34
12
4
1
2
0·5
2·5
4·5
6·5
8·5
10·5
12·5
14·5
16·5
18·5
20·5
22·5
CLASS INTERVAL OF SCORES


18
DELHI BOARD
B (iii)
N=229
FREQUENCY
0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
2
7
59
41
53
23
16
17
7
3
0
1
0·5
2·5
4·5
6·5
8·5
10·5
12·5
14·5
16·5
18·5
20·5
22·5
24·5
CLASS INTERVAL OF SCORES


19
CALCUTTA BOARD
B(iii) N = 114
FREQUENCY
0
3
6
9
12
15
18
21
24
27
30
33
36
39
1
4
14
38
18
19
16
2
2
2·5
4·5
6·5
8·5
10·5
12·5
14·5
16·5
18·5
20·5
CLASS INTERVAL OF SCORES


20
AHMEDABAD BOARD
N =180
B = (iii)
FREQUENCY
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42
45
9
45
41
33
27
23
2
4·5
6·5
8·5
10·5
12·5
14·5
16·5
18·5
CLASS INTERVAL OF SCORES

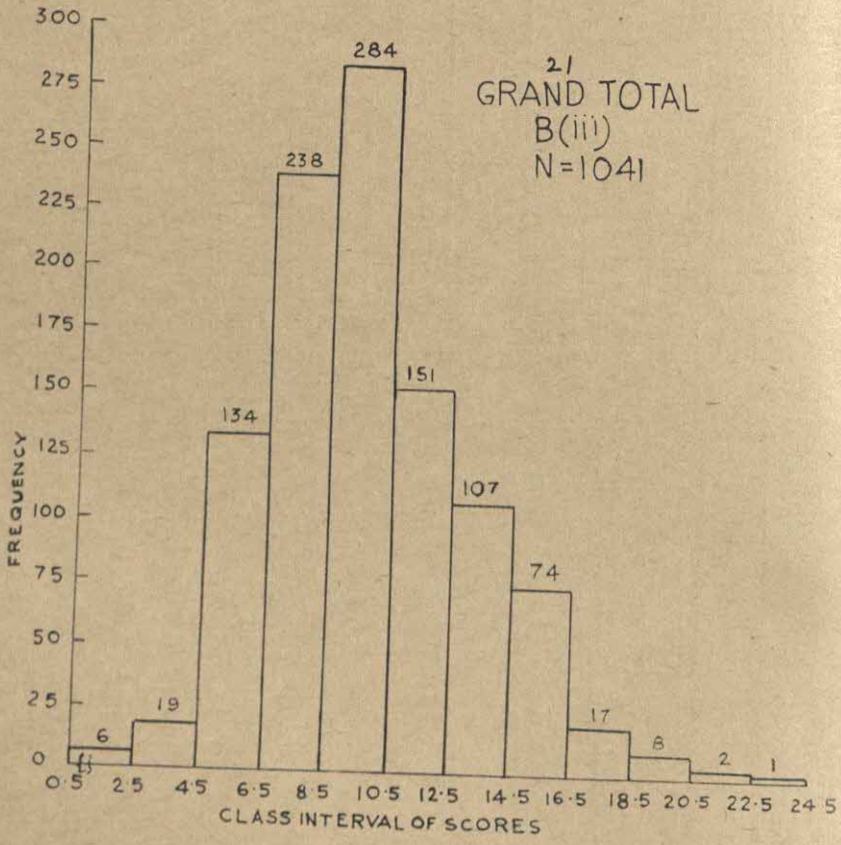
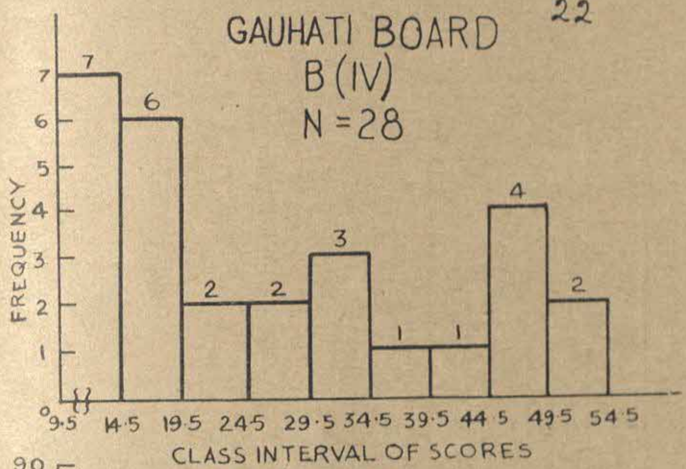
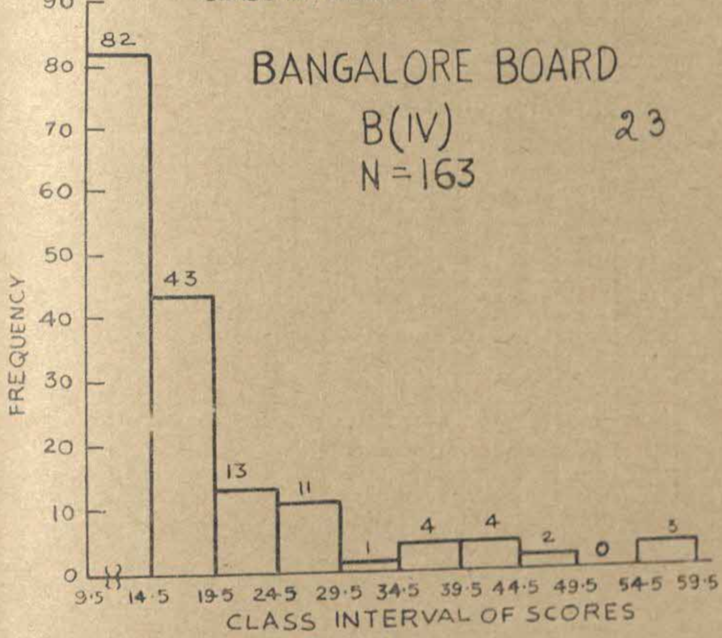

21
GRAND TOTAL
B(iii)
N=1041
FREQUENCY
300
275
250
225
200
175
150
125
100
75
50
25
0
6
19
134
238
284
151
107
74
17
8
2
1
0·5
2·5
4·5
6·5
8·5
10·5
12·5
14·5
16·5
18·5
20·5
22·5
24·5
CLASS INTERVAL OF SCORES

TABLE IV FREQUENCY DISTRIBUTION OF INTERVIEW SCORES

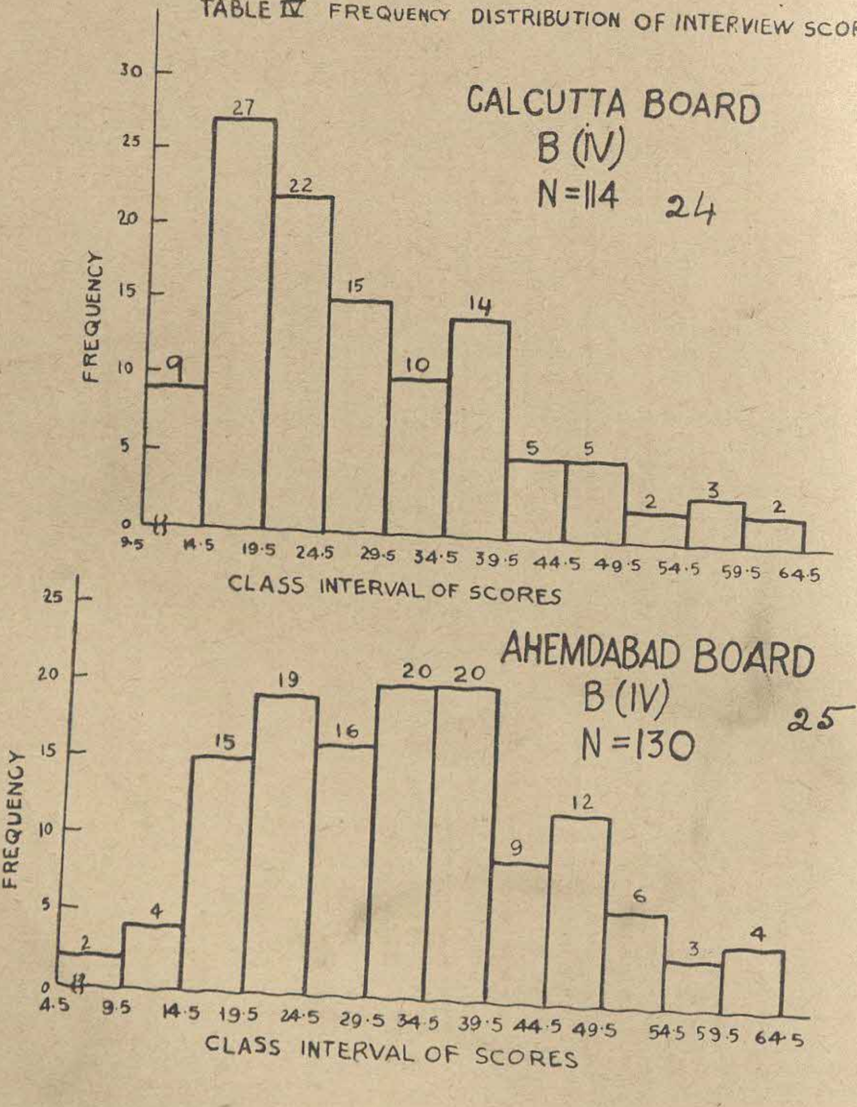


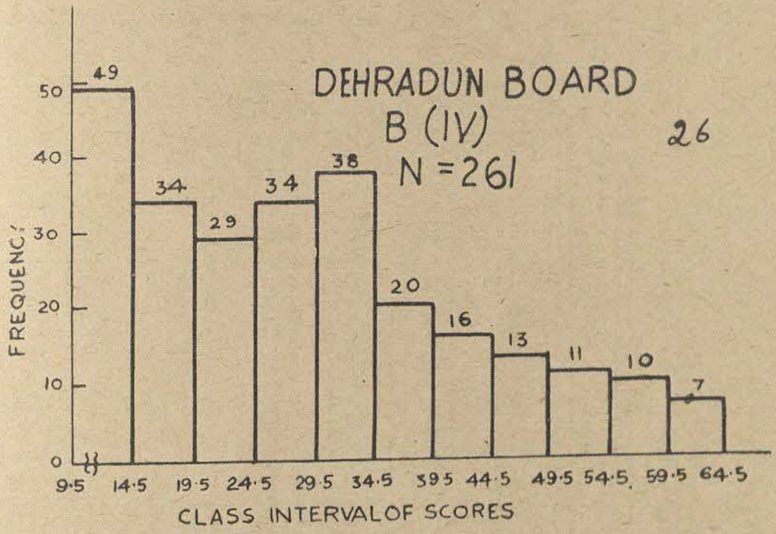
22

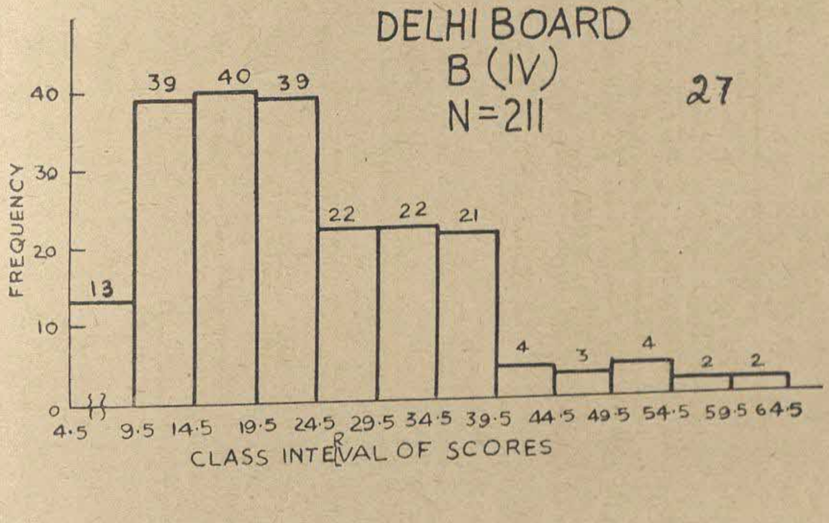


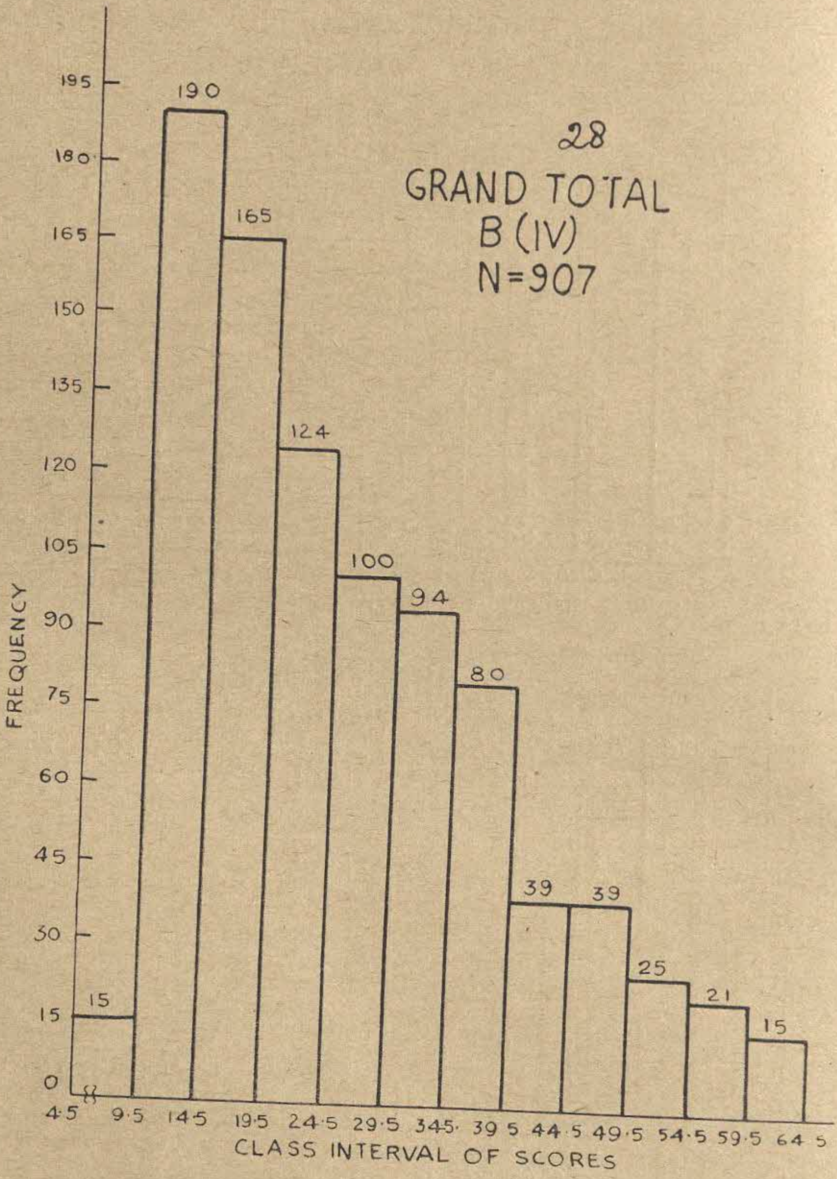
23

TABLE IV FREQUENCY DISTRIBUTION OF INTERVIEW SCORES



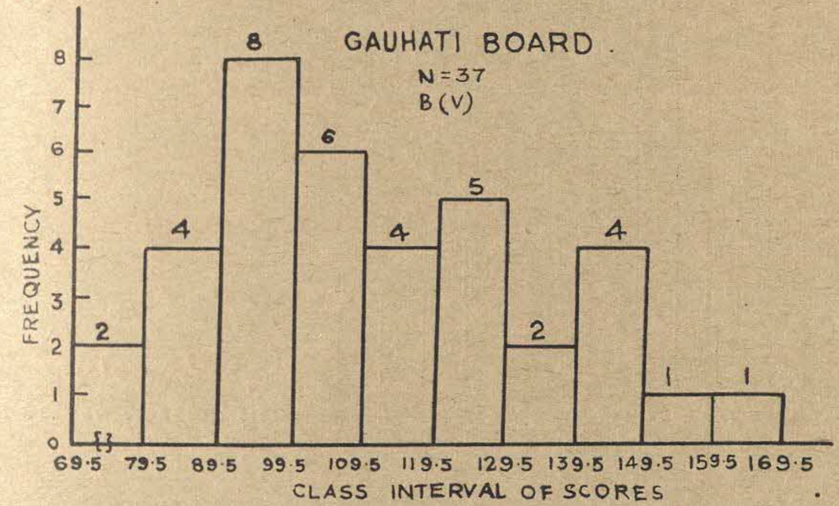

DEHRADUN BOARD
B (IV)
N = 261
26
FREQUENCY
0
10
20
30
40
50
49
34
29
34
38
20
16
13
11
10
7
9·5
14·5
19·5
24·5
29·5
34·5
39·5
44·5
49·5
54·5
59·5
64·5
CLASS INTERVAL OF SCORES


DELHI BOARD
B (IV)
N=211
27
FREQUENCY
0
10
20
30
40
13
39
40
39
22
22
21
4
3
4
2
2
4·5
9·5
14·5
19·5
24·5
29·5
34·5
39·5
44·5
49·5
54·5
59·5
64·5
CLASS INTERVAL OF SCORES

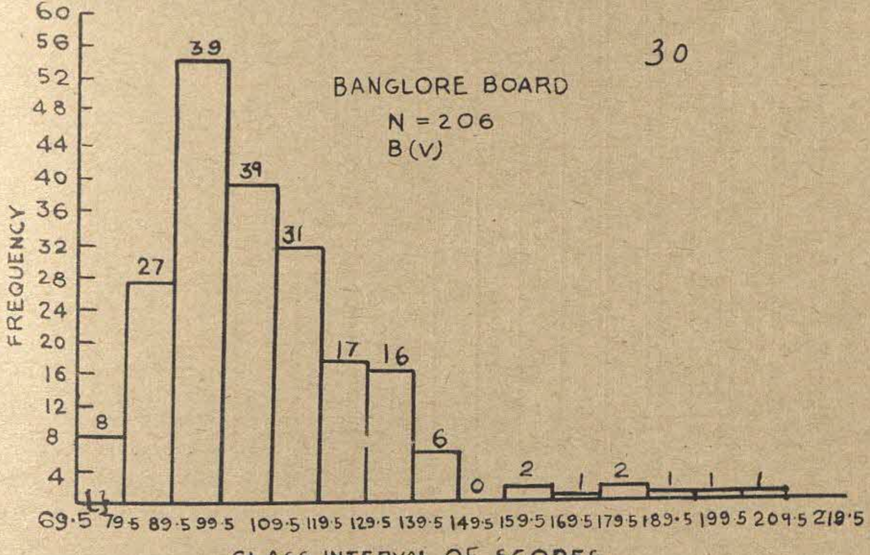

28
GRAND TOTAL
B (IV)
N=907
FREQUENCY
195
180
165
150
135
120
105
90
75
60
45
30
15
0
190
165
124
100
94
80
39
39
25
21
15
15
4·5
9·5
14·5
19·5
24·5
29·5
34·5
39·5
44·5
49·5
54·5
59·5
64·5
CLASS INTERVAL OF SCORES

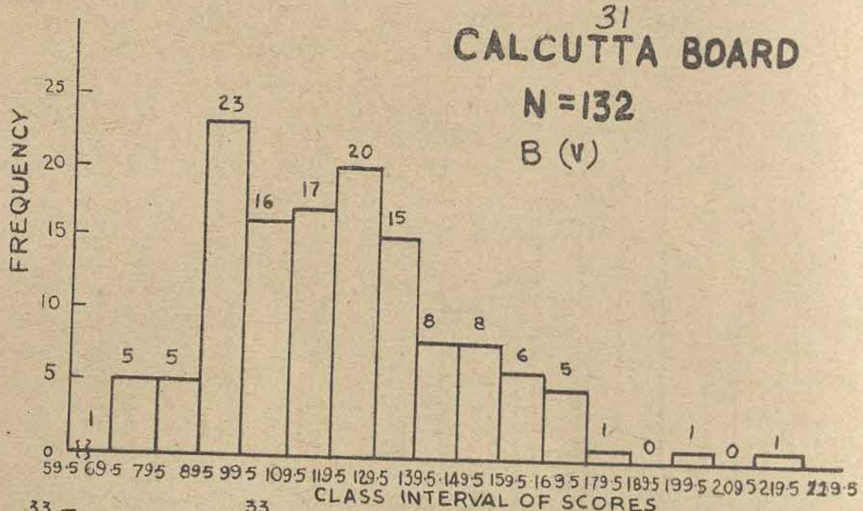
29

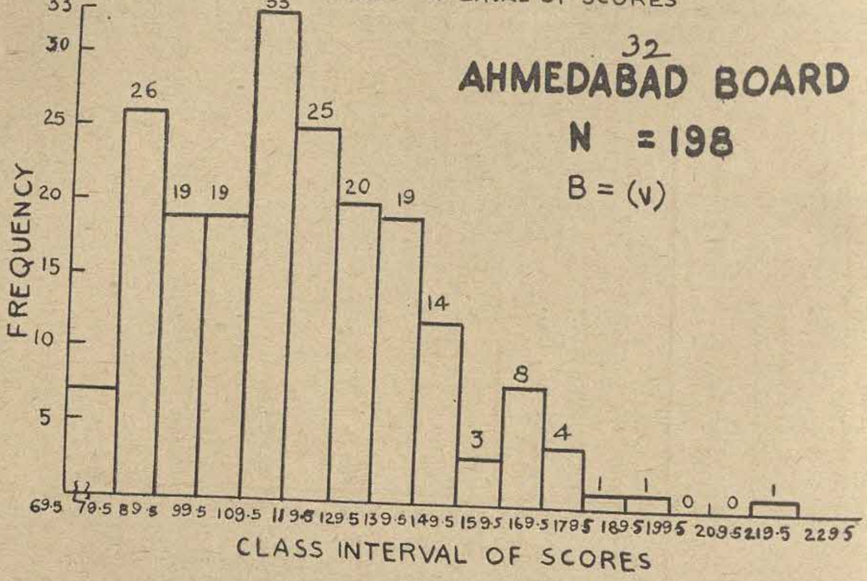
FREQUENCY DISTRIBUTION OF COMPOSITE SCORES-INTERVIEW BOARDWISE.

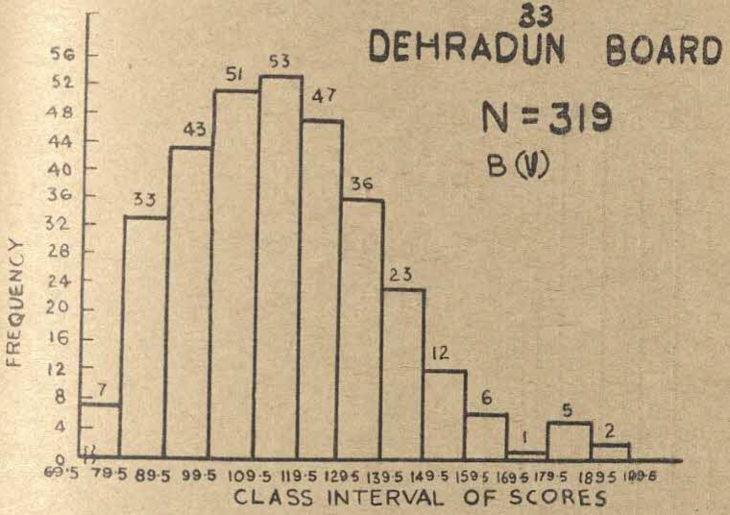


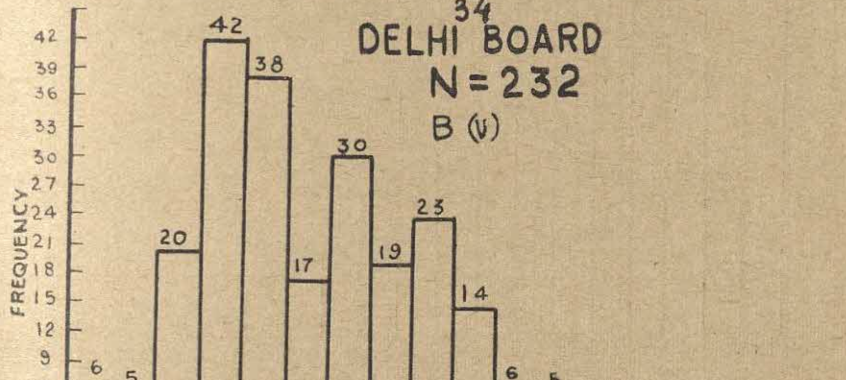
30

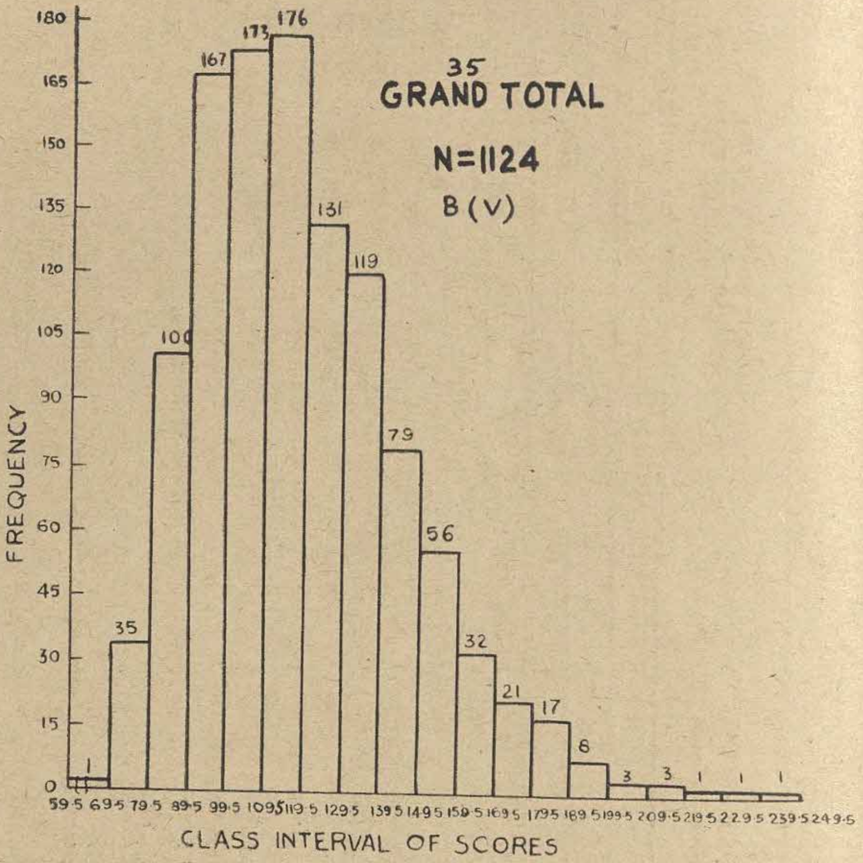



31
CALCUTTA BOARD
N =132
B (V)
FREQUENCY
0
5
10
15
20
25
1
5
5
23
16
17
20
15
8
8
6
5
1
0
1
0
1
59·5
69·5
79·5
89·5
99·5
109·5
119·5
129·5
139·5
149·5
159·5
169·5
179·5
189·5
199·5
209·5
219·5
229·5
CLASS INTERVAL OF SCORES


32
AHMEDABAD BOARD
N = 198
B = (V)
FREQUENCY
5
10
15
20
25
30
33
26
19
19
33
25
20
19
14
3
8
4
1
1
0
0
1
69·5
79·5
89·5
99·5
109·5
119·5
129·5
139·5
149·5
159·5
169·5
179·5
189·5
199·5
209·5
219·5
229·5
CLASS INTERVAL OF SCORES


33
DEHRADUN BOARD
N = 319
B (V)
FREQUENCY
56
52
48
44
40
36
32
28
24
20
16
12
8
4
0
7
33
43
51
53
47
36
23
12
6
1
5
2
69·5
79·5
89·5
99·5
109·5
119·5
129·5
139·5
149·5
159·5
169·5
179·5
189·5
199·5
CLASS INTERVAL OF SCORES


34
DELHI BOARD
N = 232
B (V)
FREQUENCY
42
39
36
33
30
27
24
21
18
15
12
9
6
3
0
6
5
20
42
38
17
30
19
23
14
6
5
4
0
2
0
0
1
69·5, 79·5, 89·5, 99·5, 109·5, 119·5, 129·5, 139·5, 149·5, 159·5, 169·5, 179·5, 189·5, 199·5, 209·5, 219·5, 229·5, 239·5
CLASS INTERVAL OF SCORES


35
GRAND TOTAL
N=1124
B (V)
FREQUENCY
180
165
150
135
120
105
90
75
60
45
30
15
0
1
35
100
167
173
176
131
119
79
56
32
21
17
8
3
3
1
1
1
59·5
69·5
79·5
89·5
99·5
109·5
119·5
129·5
139·5
149·5
159·5
169·5
179·5
189·5
199·5
209·5
219·5
229·5
239·5
249·5
CLASS INTERVAL OF SCORES

APPENDIX XI

FOLLOWUP PREDICTIVE STUDY OF SCIENCE TALENT SEARCH SCHOLARS 1963
[MARKS OBTAINED IN B.SC. PART I & SCIENCE TALENT SEARCH EXAM, 1963]

S. No.	Name	SCIENCE TALENT SEARCH SCORES								B.SC.1st YEAR MARKS							
		Sc. Apt. Test		*Essay*		*Interview*		*Total*		*Physics*		*Chemistry*		*Mathematics*		*Total*	
			Rank		Rank		Rank		Rank		Rank		Rank		Rank		Rank
1.	Sh. L. Sarangan	122	1	34	2	69	1	235	1	73	1	80	1	69	1	222	1
2.	Sh. Kanwal Nath	96	6	35	1	58	2	197	2	68	3	66	3	58	4.5	192	3
3.	Sh. Amit Roy	112	2	30	4.5	44	7	196	3	66	5	64	5	47	6	177	6
4.	Km. Geeta Trivedi	101	5	30	4.5	51	4	192	4	67	4	65	4	58	4.5	190	4
5.	Km. Prabha Bapat	102	4	28	6	50	5.5	190	5	58	6	74	2	62	2	194	2
6.	Sh. P.S. Bhattacharya	105	3	19	7	55	3	189	6	71	2	57	7	60	3	188	5
7.	Sh. K. Sampath	92	7	31	3	50	5.5	183	7	52	7	60	6	34	7	146	7

$r_{Txp} = 0.61$ (T represents Total of STS)

$r_{Txc} = 0.72$ (p, c, m represent scores on Physics, Chemistry and Mathematics)

$r_{Txm} = 0.41$

$r_{Txc.t} = 0.65$ (c.t represents total of classmarks in Physics, Chemistry and Mathematics)

APPENDIX XII

NEEDED RESEARCH

1. A factorial analysis of the subtests of the Science Aptitude Test may be done to ascertain the latent structure of the different areas and the abilities called into play to respond correctly to the subtests.

2. A factorial analysis of the intercorrelations of the four tools of selection, *i.e.* S.A.T., Essay, Interview and Project Report may also be worked out to see the degree of overlap between the various tests of selection.

3. To study and compare the success ratio amongst those who have secured less than the cut off point, *viz.*, 55% at the High School or equivalent examination and above the cut off point in order to judge the suitability of fixing the cut off point such that the chances of a talent being lost, on account of this arbitrary hurdle, does not exceed a pre-assigned small quantity.

4. To study the differential pattern of responses of the science and nonscience students on thought type items to judge how far verbal and comprehension abilities alone, as different from scientific reasoning, contribute to the success on such items.

5. A follow-up study of awardees to establish predictive validity in respect of different subjects, *e.g.*, Physics, Chemistry, Mathematics and Biology and overall success at the University level.

6. A study of the nonacademic correlates of success like socio-economic conditions ; education of the parents ; scientific environment at home ; institutional variables, *e.g.* laboratory equipment and library facilities, academic background of teachers, traditions and goals of the institution ; level of expectation of the parents from their children and the achievement-motivation among the children, individually and in the peer group.

7. To compare the performance of the awardees (who have opted for an engineering course) on an engineering aptitude test as against that on the Science Aptitude Test to find out whether the fallouts

from basic science courses have done so because of their inherent aptitude for engineering or due to other reasons.

8. A factorial analysis of the Science Aptitude Test alongwith other standardised tests of Intelligence, Aptitude and Achievement to ascertain the factorial content of the Science Aptitude Test.
9. A comparative study of the Science Talent Search tools of India as against those of other countries like the ones used at the Westing House, U.S.A., National Merit Scholarship Scheme, U.S.A. ; Jagdis Bose Science Talent Search, West Bengal ; Scientific Olympics, Russia, Hungary and Poland, the Citizen's Public Halls of Japan and Educational Testing Service, Princeton, U.S.A. etc., with a view to analyse the content, mode of selection, tools utilised, reliability, validity and usuability.
10. To compare the administrative aspects of the scheme with those of parallel schemes in other countries to study the decentralisation of the procedure of selection for efficiency and uniformity ; the role of good publicity in drawing talents to take the examination.
11. To study the attitude of students towards basic science, engineering and medical courses.
12. To study the evaluative aspects of the tools of selection as judged by the contestants, the teachers, the scientists and the administrators.
13. To study the personality structure of the high achievers as against a control group of low achievers.
14. To study the differences in performance of a group of awardees on an accelerated and intensive syllabus and course of study as against a control group taught under the traditional syllabus and system of teaching.
15. A study of the reliability in the marking system of the same scripts of the essay paper by a set of independent examiners.
16. To study the sampling fluctuations of the reliability coefficient of the Science Aptitude Test on account of sampling of items from the possible domain of items.
17. To study the effect on the reliability of the test of discarding items of low discriminating power.
18. To study the inter-state variations in respect of average performance on the Science Talent Search tests and possible reasons thereof.

19. To study the level of aspirations of the awardees as distinct from a control group of non-awardees with a view to determine the role played by such psychological variables in determining individual success.

20. To study :

    (i) the role played by institutional variables in promoting scientific creativity amongst awardees ;

    (ii) the role played by scientific olympics in promoting the talents by evoking a healthy competitive spirit for excellence in cognitive domain.

APPENDIX XIII

(A) ITEM-ANALYSIS DATA FOR THE DISCRIMINATIVE AND DIFFICULTY VALUES OF ITEMS OF SCIENCE APTITUDE TEST

Item No.	*Correct items (top group)*	*Correct items (Bottom group)*	*Discriminative value of each item*	*Difficulty value of each item*	*Remarks*	
1	2	3	4	5	6	
1	38	31	5	42	Rejected	Physics
2	65	47	11	53	–do–	–do–
3	87	50	28	60	Selected	–do–
4	16	11	6	25	Rejected	–do–
5	23	23	0	34	–do–	–do–
6	57	27	19	45	Selected	–do–
7	76	35	26	53	–do–	–do–
8	49	32	10	45	Rejected	–do–
9	59	22	25	44	Selected	–do–
10	36	23	10	39	Rejected	–do–
11	65	23	27	46	Selected	Chemistry
12	12	5	15	20	Rejected	–do–
13	63	39	14	51	–do–	–do–
14	94	59	32	66	Selected	–do–
15	41	24	15	39	Rejected	–do–
16	74	59	10	59	–do–	–do–
17	46	29	10	43	–do–	–do–
18	92	61	28	66	Selected	–do–
19	36	24	8	39	Rejected	–do–
20	66	41	15	52	–do–	–do–
21	35	26	7	39	–do–	Mathematics
22	46	25	14	42	–do–	–do–
23	16	16	0	28	–do–	–do–
24	57	24	20	44	Selected	–do–
25	27	18	6	34	Rejected	–do–
26	50	30	13	44	–do–	–do–
27	25	12	12	30	–do–	–do–
28	59	13	34	41	Selected	Botany
29	55	22	21	43	–do–	–do–
30	46	9	31	35	–do–	–do–
31	36	7	27	31	–do–	–do–
32	36	18	14	37	Rejected	Zoology
33	64	17	31	44	Selected	–do–
34	46	18	20	40	–do–	–do–

1	2	3	4	5	6	
35	57	24	22	44	Selected	Zoology
36	69	19	34	46	-do-	Meteorology
37	19	12	8	27	Rejected	-do-
38	49	15	25	39	Selected	-do-
39	36	12	20	34	-do-	-do-
40	39	7	30	33	-do-	-do-
41	22	13	10	30	Rejected	Astronomy
42	42	20	15	39	-do-	-do-
43	38	17	16	37	-do-	-do-
44	25	13	10	31	-do-	-do-
45	44	14	24	47	Selected	-do-
46	53	18	24	41	-do-	Geology
47	25	19	5	33	Rejected	-do-
48	71	35	22	52	Selected	-do-
49	36	13	20	35	-do-	-do-
50	64	27	24	47	-do-	-do-
51	36	15	18	35	-do-	Physiology & Hygiene
52	11	11	0	23	Rejected	-do-
53	55	18	25	42	Selected	-do-
54	56	31	15	46	Rejected	-do-
55	50	36	8	46	-do-	-do-
56	40	15	20	47	Selected	Engineering
57	52	15	27	40	-do-	-do-
58	25	11	15	30	Rejected	-do-
59	24	11	15	29	-do-	-do-
60	15	15	0	27	-do-	-do-
61	25	21	4	34	-do-	Agriculture
62	50	13	28	39	Selected	-do-
63	33	19	10	37	Rejected	-do-
64	50	25	17	43	Selected	-do-
65	60	21	25	44	-do-	-do-
66	56	28	17	45	-do-	Physics
67	11	15	-5	25	Rejected	-do-
68	36	26	7	40	-do-	-do-
69	76	47	19	56	Selected	-do-
70	56	30	16	46	Rejected	-do-
71	43	30	9	43	-do-	-do-
72	40	12	22	35	Selected	-do-
73	11	14	-6	25	Rejected	-do-
74	51	29	14	44	-do-	-do-
75	53	36	10	47	-do-	-do-
76	83	44	27	58	Selected	Chemistry
77	94	54	36	65	-do-	-do-
78	77	43	22	55	-do-	-do-
79	30	2	8	36	Rejected	-do-
80	45	34	7	44	-do-	-do-

1	2	3	4	5	6	
81	53	27	17	44	Selected	Chemistry
82	69	37	19	51	–do–	–do–
83	20	8	16	26	Rejected	–do–
84	55	24	20	44	Selected	–do–
85	47	37	6	45	Rejected	–do–
86	76	36	26	53	Selected	Mathematics
87	68	21	30	46	–do–	–do–
88	59	30	18	47	–do–	–do–
89	28	23	5	36	Rejected	–do–
90	70	29	25	50	Selected	–do–
91	87	23	47	53	–do–	–do–
92	76	30	30	52	–do–	–do–
93	95	48	42	63	–do–	Botany
94	72	41	20	53	–do–	–do–
95	98	60	41	69	–do–	–do–
96	93	55	34	63	–do–	–do–
97	76	29	30	51	–do–	Zoology
98	94	47	40	62	–do–	–do–
99	55	21	23	43	–do–	–do–
100	88	37	38	58	–do–	–do–
101	43	33	6	43	Rejected	Meteorology
102	44	19	18	39	Selected	–do–
103	65	10	45	40	–do–	–do–
104	37	8	23	33	–do–	–do–
105	57	4	47	36	–do–	–do–
106	54	10	35	39	–do–	Astronomy
107	8	11	—	—	Rejected	–do–
108	62	26	23	46	Selected	–do–
109	65	30	22	49	–do–	–do–
110	56	16	28	41	–do–	–do–
111	79	27	35	52	–do–	Geology
112	68	19	33	45	–do–	–do–
113	73	19	36	47	–do–	–do–
114	51	22	20	42	–do–	–do–
115	71	19	35	46	–do–	–do–
116	75	37	25	53	–do–	Physiology & Hygiene
117	60	14	33	42	–do–	–do–
118	42	10	27	35	–do–	–do–
119	55	20	24	42	–do–	–do–
120	52	19	22	42	–do–	–do–
121	86	24	45	53	–do–	Engineering
122	63	13	36	42	–do–	–do–
123	47	19	20	40	–do–	–do–
124	21	4	24	24	–od–	–do–
125	35	12	20	34	–do–	–do–
126	50	11	30	38	–do–	Agriculture

1	2	3	4	5	6	
127.	26	20	6	24	Rejected	Agriculture
128.	25	16	18	32	-do-	-do-
129.	75	18	39	48	Selected	-do-
130.	84	29	38	54	-do-	-do-
131.	77	27	33	51	-do-	History & Philosophy of science
132.	39	7	30	32	-do-	-do-
133.	25	8	20	28	-do-	-do-
134.	36	10	23	33	-do-	-do-
135.	49	9	33	37	-do-	-do-
136.	27	6	24	27	-do-	-do-
137.	68	11	42	42	-do-	-do-
138.	69	15	38	44	-do-	-do-
139.	13	10	5	23	Rejected	-do-
140.	44	9	30	35	Selected	-do-
141.	61	17	30	43	-do-	Bio-Physics
142.	49	11	30	38	-do-	-do-
143.	45	20	18	40	-do-	-do-
144.	10	13	Negative	24	Rejected	-do-
145.	71	25	30	49	Selected	-do-
146.	58	17	29	42	-do-	-do-
147.	67	13	39	43	-do-	-do-
148.	51	13	29	39	-do-	-do-
149.	56	16	28	41	-do-	-do-
150.	48	16	23	39	-do-	-do-
151.	21	9	15	27	Rejected	Bio-Chemistry
152.	39	15	20	37	Selected	-do-
153.	19	6	20	24	-do-	-do-
154.	36	14	18	35	-do-	-do-
155.	48	13	26	38	-do-	-do-
156.	58	16	30	42	-do-	-do-
157.	41	16	20	37	-do-	-do-
158.	49	13	22	38	-do-	-do-
159.	46	17	21	39	-do-	-do-
160.	19	10	10	27	Rejected	-do-

Items selected = 106 (66%)
Items rejected = 54 (34%)
160

(B) AN ANALYSIS OF THE ITEMS SELECTED AND REJECTED ON THE BASIS OF DISCRIMINATIVE AND DIFFICULTY VALUES

	Factual Type Items			*Thought Type Items*			*Total*		
Areas	*Items rejected*		*Items selected*	*Items rejected*		*Items selected*	*Items rejected*		*Items selected*
Physics	6	+	4	7	+	3	13	+	7
Chemistry	7	+	3	4	+	6	11	+	9
Mathematics	6	+	1	1	+	6	7	+	7
Botany	0	+	4	0	+	4	0	+	8
Zoology	1	+	3	0	+	4	1	+	7
Meteorology	1	+	4	1	+	4	2	+	8
Astronomy	4	+	1	1	+	4	5	+	5
Geology	1	+	4	0	+	5	1	+	9
Physiology & Hygiene	3	+	2	0	+	5	3	+	7
Engineering	3	+	2	0	+	5	3	+	7
Agriculture	2	+	3	2	+	3	4	+	6
History & Philosophy of science	—		—	1	+	9	1	+	9
Bio-Physics	—		—	1	+	9	1	+	9
Bio-Chemistry	—		—	2	+	8	2	+	8
	34	+	31	20		75	N = 54	+	106
	52%		48%	21%		79%	34%		66%
	Total = (65)			Total = 95			Total = 160		

APPENDIX XIV

DATA FOR THE RELIABILITY OF THE SCIENCE APTITUDE TEST

S. No. of item	*No. of students passing the item*	*No. of students failing at the item*	*p = proportion passing at the item*	*q = proportion failing at the item*	*pq*
1	2	3	4	5	6
1	135	235	135/370	235/370	0.2316
2	213	157	213/370	157/370	0-2441
3	249	121	249/370	121/370	0.2199
4	62	308	62/370	308/370	0.1394
5	86	284	86/370	284/370	0.1783
6	143	227	143/370	227/370	0.2370
7	209	161	209/370	161/370	0.2456
8	153	217	153/370	217/370	0.2424
9	139	231	139/370	231/370	0.2344
10	112	258	112/370	258/370	0.2109
11	155	215	155/370	215/370	0.2433
12	23	347	23/370	347/370	0.0583
13	170	200	170/370	200/370	0.2482
14	265	105	265/370	105/370	0.2031
15	123	247	123/370	247/370	0.2218
16	234	136	234/373	136/370	0.2323
17	152	218	152/370	218/370	0.2419
18	281	89	281/370	89/370	0.1826
19	117	253	117/370	253/370	0.2161
20	187	183	187/370	183/370	0.2498
21	111	259	111/370	259/370	0.2099
22	117	253	117/370	253/370	0.2161
23	52	318	52/370	318/370	0.1207
24	138	232	138/370	232/370	0.2337
25	87	283	87/370	283/370	0.1797
26	155	215	155/370	215/370	0.2433
27	68	302	68/370	302/370	0.1499
28	120	250	120/370	250/370	0.2190
29	138	232	138/370	232/370	0.2337
30	91	279	91/370	279/370	0.1853
31	74	296	74/370	296/370	0.1599
32	120	250	120/370	250/370	0.2190
33	130	240	130/370	240/370	0.2278
34	111	259	111/370	259/370	0.2099
35	145	225	145/370	225/370	0.2382

1	2	3	4	5	6
36	166	204	166/370	204/370	0.2472
37	63	307	63/370	307/370	0.1412
38	127	243	127/370	243/370	0.2253
39	85	285	85/370	285/370	0.1768
40	82	288	82/370	288/370	0.1724
41	57	313	57/370	313/370	0.1302
42	127	243	127/370	243/370	0.2253
43	89	281	89/370	281/370	0.1826
44	78	292	78/370	292/370	0.1663
45	118	252	118/370	252/370	0.2171
46	134	236	134/370	236/370	0.2309
47	99	271	99/370	271/370	0.1959
48	198	172	198/370	172/370	0.2486
49	88	282	88/370	282/370	0.1812
50	170	200	170/370	200/370	0.2482
51	95	275	95/370	275/370	0.1907
52	36	334	36/370	334/370	0.0878
53	125	245	125/370	245/370	0.2236
54	171	199	171/370	199/370	0.2484
55	100	270	100/370	270/370	0.1971
56	89	281	89/370	281/370	0.1826
57	128	242	128/370	242/370	0.2261
58	70	300	70/370	300/370	0.1533
59	68	302	68/370	302/370	0.1499
60	59	311	59/370	311/370	0.1339
61	91	279	91/370	279/370	0.1853
62	104	266	104/370	266/370	0.2019
63	90	280	90/370	280/370	0.1840
64	139	231	139/370	231/370	0.2344
65	137	233	137/370	233/370	0.2330
66	154	216	154/370	216/370	0.2428
67	66	304	66/370	304/370	0.1465
68	114	256	114/370	256/370	0.2130
69	229	141	229/370	141/370	0.2357
70	142	228	142/370	228/370	0.2363
71	110	260	110/370	260/370	0.2088
72	88	282	88/370	282/370	0.1812
73	60	310	60/370	310/370	0.1358
74	144	226	144/370	226/370	0.2378
75	169	201	169/370	201/370	0.2480
76	222	148	222/370	148/370	0.2398
77	258	112	258/370	112/370	0.2109
78	200	170	200/370	170/370	0·2482
79	112	258	112/370	258/370	0.2109
80	132	238	132/370	238/370	0.2293
81	141	229	141/370	229/370	0.2357
82	173	197	173/370	197/370	0.2488

1	2	3	4	5	6
83	49	321	49/370	321/370	0.1148
84	131	239	131/370	239/370	0.2286
85	134	236	134/370	236/370	0.2309
86	210	160	210/370	160/370	0.2453
87	155	215	155/370	215/370	0.2433
88	167	203	167/370	203/370	0.2475
89	94	276	94/370	276/370	0.1894
90	166	204	166/370	204/370	0.2472
91	196	174	196/370	174/370	0.2490
92	172	198	172/370	198/370	0.2486
93	273	97	273/370	97/370	0.1933
94	191	179	191/370	179/370	0.2498
95	297	73	297/370	73/370	0.1583
96	277	93	277/370	93/370	0.1881
97	190	180	190/370	180/370	0.2497
98	263	107	263/370	107/370	0.2054
99	114	256	114/370	256/370	0.2130
100	212	158	212/370	158/370	0.2445
101	150	220	150/370	220/370	0.2409
102	99	271	99/370	271/370	0.1959
103	108	262	108/370	262/370	0.2066
104	87	283	87/370	283/370	0.1797
105	90	280	90/370	280/370	0.1840
106	101	269	101/370	269/370	0.1983
107	51	319	51/370	319/370	0.1188
108	153	217	153/370	217/370	0.2424
109	182	188	182/370	188/370	0.2498
110	134	236	134/370	236/370	0.2309
111	194	176	194/370	176/370	0.2493
112	144	226	144/370	226/370	0.2376
113	161	209	161/370	209/370	0.2456
114	132	238	132/370	238/370	0.2293
115	173	197	173/370	197/370	0.2488
116	192	178	192/370	178/370	0.2495
117	104	266	104/370	266/370	0.2019
118	98	272	98/370	272/370	0.1946
119	136	234	136/370	234/370	0.2323
120	124	246	124/370	246/370	0.2227
121	200	170	200/370	170/370	0.2482
122	113	257	113/370	257/370	0.2120
123	119	251	119/370	251/370	0.2180
124	67	303	67/370	303/370	0.1482
125	88	282	88/370	282/370	0.1812
126	104	266	104/370	266/370	0.2019
127	81	289	81/370	289/370	0.1709
128	87	283	87/370	283/370	0.1797
129	175	195	175/370	195/370	0.2491

1	2	3	4	5	6
130	192	178	192/370	178/370	0.2495
131	191	179	191/370	179/370	0.2498
132	69	301	69/370	301/370	0.1516
133	69	301	69/370	301/370	0.1516
134	90	280	90/370	280/370	0.1840
135	97	273	97/370	273/370	0.1933
136	66	304	66/370	304/370	0.1465
137	132	238	132/370	238/370	0.2293
138	136	234	136/370	234/370	0.2323
139	46	324	46/370	324/370	0.1088
140	81	289	81/370	289/370	0.1709
141	137	233	137/370	233/370	0.2330
142	113	257	113/370	257/370	0.2120
143	122	248	122/370	248/370	0.2209
144	47	323	47/370	323/370	0.1108
145	148	222	148/370	222/370	0.2398
146	139	231	139/370	231/370	0.2344
147	129	241	129/370	241/370	0.2269
148	131	239	131/370	239/370	0.2286
149	124	246	124/370	246/370	0.2227
150	117	253	117/370	253/370	0.2161
151	54	316	54/370	316/370	0.1246
152	83	287	83/370	287/370	0.1739
153	48	322	48/370	322/370	0.1128
154	80	290	80/370	290/370	0.1694
155	95	275	95/370	275/370	0.1907
156	133	237	133/370	237/370	0.2301
157	90	280	90/370	280/370	0.1840
158	106	264	106/370	264/370	0.2120
159	112	258	112/370	258/370	0.2109
160	65	305	65/370	305/370	0.1447

$r_{11} = 0.90$

APPENDIX XV

FIGURES AT A GLANCE

	Science Aptitude Test	*Essay*	*Interview*	*Project Report*	*S.T.S. Total*
Science Aptitude Test	—	—0.15**	—0.09*	0.02	0.57**
Essay	—0.15**	—	—0.03	0.00	0.15**
Interview	—0.09*	—0.03	—	—0.05	0.48**
Project Report	0.02	0.00	—0.05	—	0.11*
STS Total	0.57**	0.15**	0.48**	0.11*	—

*indicates significance at .05 level
**indicates significance at .01 level

APPENDIX XV (*Continued*)

TABLE 1

SCIENCE APTITUDE TEST AND ESSAY

Essay *Sc. Apt. Test*	Class Interval					Total
	0-10	10-20	20-30	30-40	40-50	
20-40	—	—	—	9	1	10
40-60	—	5	57	78	16	156
60-80	1	33	89	68	11	202
80-100	3	18	49	57	9	136
100-120	—	6	10	12	2	30
120-140	—	—	2	3	—	5
Total	4	62	207	227	39	539

$r = -0.15$

The value of '*r*' is significant at .01 level.

TABLE 2

SCIENCE APTITUDE TEST AND PROJECT REPORT

Project Report *Sc. Apt. Test*	Class Interval				Total
	0-6	6-12	12-18	18-24	
20-40	—	4	6	—	10
40-60	5	89	56	2	152
60-80	8	113	66	7	194
80-100	8	62	59	4	133
100-120	2	19	6	—	27
120-140	—	2	1	1	4
Total	23	289	194	14	520

$r = 0.02$

The value of '*r*' is not significant at .05 level.

TABLE 3

SCIENCE APTITUDE TEST AND INTERVIEW

Interview / *Sc. Apt. Test*	Class Interval							
	0-10	10-20	20-30	30-40	40-50	50-60	60-70	*Total*
0-20	—	—	—	—	—	—	—	—
20-40	—	—	1	4	3	1	1	10
40-60	—	3	28	51	45	23	6	156
60-80	—	39	55	52	27	18	3	194
80-100	—	22	36	24	22	10	3	117
100-120	—	2	4	3	5	4	5	23
120-140	—	—	—	2	1	—	2	5
Total	—	66	124	136	103	56	20	505

$r = -0.09$

The value of 'r' is significant at .05 level.

TABLE 4

SCIENCE APTITUDE TEST AND S.T.S. TOTAL

S.T.S. Total / *Sc. Apt. Test*	Class Interval							
	110-130	130-150	150-170	170-190	190-210	210-230	230-250	*Total*
0-20	—	—	—	—	—	—	—	—
20-40	8	2	—	—	—	—	—	10
40-60	92	51	11	2	—	—	—	156
60-80	87	74	31	9	—	—	1	202
80-100	12	59	36	27	3	—	—	137
100-120	—	4	9	6	7	4	—	30
120-140	—	1	—	—	3	—	1	5
Total	199	191	87	44	13	4	2	540

$r = 0.57$

The value of 'r' is highly significant at .01 level.

TABLE 5

ESSAY AND PROJECT REPORT

Project Report / *Essay*	Class Interval				
	0-6	6-12	12-18	18-24	*Total*
0-10	—	2	2	—	4
10-20	2	29	24	5	60
20-30	10	120	72	1	203
30-40	9	122	76	7	214
40-50	2	15	20	1	38
Total	23	288	194	14	519

$$r = +0.0,$$

The value of '*r*' is not significant at .05 level.

TABLE 6

ESSAY AND INTERVIEW

Interview / *Essay*	Class Interval							
	0-10	10-20	20-30	30-40	40-50	50-60	60-70	*Total*
0-10	—	—	2	—	1	—	1	4
10-20	—	5	12	19	18	7	1	62
20-30	—	25	51	47	41	21	6	191
30-40	—	32	47	61	40	23	10	213
40-50	—	3	12	9	3	5	2	34
Total	—	65	124	136	103	56	20	504

$$r = -0.03$$

The value of '*r*' is not significant at .05 level.

TABLE 7

ESSAY AND S.T.S. TOTAL

S. T. S. Total / *Essay*	Class Interval							
	110-130	130-150	150-170	170-190	190-210	210-230	230-250	*Total*
0-10	2	2	—	—	—	—	—	4
10-20	23	25	9	5	—	—	—	62
20-30	86	75	29	11	6	—	—	207
30-40	78	77	39	21	7	3	2	227
40-50	9	12	10	7	—	1	—	39
Total	198	191	87	44	13	4	2	539

$r = 0{\cdot}15$

The value of *r*' is significant at ·01 level.

TABLE 8

INTERVIEW AND S. T. S. TOTAL

S. T. S. Total / *Interview*	Class Interval							
	110-130	130-150	150-170	170-190	190-210	210-230	230-250	*Total*
0-10	—	—	—	—	—	—	—	—
10-20	39	25	2	—	—	—	—	66
20-30	59	41	19	5	—	—	—	124
30-40	61	49	15	9	2	—	—	136
40-50	23	35	28	12	4	—	1	103
50-60	2	20	16	12	5	1	—	56
60-70	—	6	3	5	2	3	1	20
Total	184	176	83	43	13	4	2	505

$r = 0{\cdot}48$

The value of '*r*' is significant at ·01 level.

TABLE 9.

PROJECT REPORT AND INTERVIEW

	Class Interval							
Interview *Project Report*	0-10	10-20	20-30	30-40	40-50	50-60	60-70	Total
0- 6	—	3	8	3	6	1	1	22
6-12	—	35	60	71	60	39	11	276
12-18	—	24	48	54	32	13	5	176
18-24	—	2	3	4	1	2	2	14
Total	—	64	119	132	99	55	19	488

$r = -0.05$

The value of '*r*' is not significant at .05 level.

TABLE 10

PROJECT REPORT AND S.T.S. TOTAL

	Class Interval							
S.T.S. Total *Project Report*	110-130	130-150	150-170	170-190	190-210	210-230	230-250	Total
0- 6	7	11	3	1	1	—	—	23
6-12	113	106	42	19	6	3	—	289
12-18	64	68	38	20	3	1	—	194
18-24	4	2	3	3	1	—	1	14
Total	188	187	86	43	11	4	1	520

$r = 0.11$

The value of '*r*' is significant at .01 level.

APPENDIX XVI

FREQUENCY DISTRIBUTION OF MONTHLY INCOME (*in rupees*) OF THE PARENTS OF THE S.T.S. AWARDEES

Class interval	*Frequency*
9500-10000	1
9000-9500	0
8500-9000	0
8000-8500	0
7500-8000	0
7000-7500	0
6500-7000	0
6000-6500	0
5500-6000	1
5000-5500	0
4500-5000	3
4000-4500	0
3500-4000	3
3000-3500	5
2500-3000	1
2000-2500	5
1500-2000	14
1000-1500	23
500-1000	57
0-500	88
	N = 201

Median = 609.5

Correlation figure between Science Talent Search scores and the monthly income of the parents = 0.24 (significant at .01 level for 199 degrees of freedom).

APPENDIX XVI (*Continued*)

TABLE SHOWING SERIAL NO:, MONTHLY INCOME AND COMPOSITE SCORE ON SCIENCE TALENT SEARCH TESTS

Serial No. in order of Merit	*Monthly income of partents/ guardians (in rupees)*	*Monthly Income from other sources (in rupees)*	*Total Income of family (in rupees)*	*Composite score on Science Talent Search Examination*	*State/Territory to which awardees belong*
1	2	3	4	5	6
1	2,750	600	3,350	245	Delhi
2	3,000	—	3,000	238	M.S.
4	2,250	850	3,100	218	Delhi
6	3,500	—	3,500	212	Madras
7	475	200	675	205	W.B.
8	1,500	—	1,500	202	M.S
13	1,450	—	1,450	198	Madras
14	550	—	550	196	Punjab
16	1,200	—	1,200	191	U.P.
18	490	960	1,450	190	Delhi
19	3,800	—	3,800	190	Delhi
21	111	—	111	189	U.P.
22	950	—	950	188	W.B.
23	1,500	—	1,500	188	M.P.
25	1,800	—	1,800	188	Punjab
26	900	—	900	186	Delhi
29	272	—	272	184	M.S.
30	72	—	72	182	Mysore
34	520	—	520	180	M.S.
35	1,865	—	1,865	179	M.S.
36	1,500	—	1,500	179	M.S.
38	452	—	452	178	Delhi
39	1,420	—	1,420	177	Delhi
40	2,000	—	2,000	177	Gujrat
46	1,300	—	1,300	174	W.B.
47	1,000	—	1,000	173	W.B.
51	99	326	425	173	M.P.
52	120	—	120	172	Gujrat
55	170	—	170	171	Gujrat
56	1,000	—	1,000	170	W.B.
58	960	—	960	170	Delhi
59	1,150	—	1,150	170	Bihar
62	590	—	590	168	W.B.
66	614	—	614	167	Delhi

1	2	3	4	5	6
68	250	—	250	166	Mysore
70	500	—	500	166	Punjab
72	1,875	—	1,875	165	Delhi
74	1,865	—	1,865	165	M.S.
76	1,000	—	1,000	164	U.P.
77	740	—	740	163	Delhi
78	200	500	700	163	W.B.
81	300	100	400	163	Punjab
83	300	—	300	162	M.S.
84	980	—	980	161	Delhi
85	450	—	450	161	Orissa
87	780	310	1,090	161	U.P.
88	263	425	688	160	Delhi
89	500	—	500	160	W.B.
92	281	263	544	159	Delhi
94	1,000	—	1,000	158	M.S.
95	240	—	240	158	W.B.
101	1,000	—	1,000	157	Delhi
105	287	—	287	156	W.B.
107	5,000	5,000	10,000	156	U.P.
108	300	—	300	156	U.P.
109	300	—	300	156	U.P.
111	500	—	500	155	M.P.
112	500	200	700	155	M.S.
113	3,000	—	3,000	155	M.S.
116	2,325	—	2,325	155	Delhi
117	350	250	600	154	Punjab
118	400	—	400	154	Punjab
121	350	—	350	153	W.B.
123	638	—	638	153	Delhi
125	700	—	700	152	M.P.
127	1,855	—	1,855	152	Delhi
129	650	—	650	152	Punjab
130	100	—	100	152	Punjab
131	2,200	—	2,200	152	Punjab
135	81	130	211	151	Delhi
136	1,000	—	1,000	151	U.P.
137	800	290	1,090	150	M.P.
138	250	—	250	150	M.P.
141	55	—	55	150	M.S.
144	1,000	—	1,000	150	W.B.
148	770	—	770	150	Delhi
150	535	—	535	149	M.P.
152	197	—	197	149	M.S.
153	1,250	—	1,250	149	M.S.
154	3,700	—	3,700	149	Pondicherry
155	972	—	972	149	Delhi

1	2	3	4	5	6
161	98	—	98	148	Punjab
162	298	94	392	148	Punjab
163	160	—	160	148	Punjab
164	900	1,000	1,900	147	M.P.
165	355	—	355	147	W.B.
169	2,000	—	2,000	147	Punjab
170	3,500	—	3,500	147	U.P.
171	116	—	116	147	Punjab
172	1,520	50	1,570	147	Mysore
173	2,500	—	2,500	146	M.S.
176	830	—	830	146	Madras
182	177	150	327	145	M.S.
183	245	—	245	145	M.S.
186	590	—	590	145	Delhi
187	150	200	350	145	U.P.
189	251	—	251	145	Punjab
193	265	—	265	144	U.P.
194	166	30	196	143	M.S.
195	700	—	700	143	Madras
197	203	—	203	143	Delhi
199	4,000	1,000	5,000	142	Gujrat
200	1,400	—	1,400	142	M.P.
201	100	—	100	142	M.S.
202	1,500	—	1,500	142	M.S.
203	1,500	—	1,500	142	W.B.
204	5,000	—	5,000	142	W.B.
205	50	—	50	142	Orissa
208	350	—	350	142	Delhi
210	1,700	—	1,700	142	U.P.
212	500	200	700	142	U.P.
213	600	—	600	141	Gujrat
214	1,750	—	1,750	141	M.S.
215	220	—	220	141	M.S.
217	125	—	125	141	Delhi
218	972	200	1,172	141	Delhi
224	223	—	223	140	U.P.
225	850	—	850	140	U.P.
226	225	—	225	140	Punjab
227	125	—	125	140	Delhi
228	495	—	495	139	M.P.
229	200	400	600	139	W.B.
233	260	—	260	139	A.P.
235	1,540	—	1,540	139	Delhi
236	150	—	150	139	Punjab
237	300	200	500	139	Punjab
238	181	—	181	139	Punjab
239	30	—	30	138	M.P.

1	2	3	4	5	6
240	700	—	700	138	M.S.
242	972	—	972	138	Delhi
245	250	225	475	138	U.P.
246	1,000	—	1,000	138	U.P.
248	150	150	300	137	M.P.
253	100	—	100	137	Madras
254	550	—	550	137	A.P.
257	485	—	485	137	U.P.
260	600	—	600	136	M.P.
261	100	—	100	136	Manipur
262	641	—	641	136	W.B.
266	500	—	500	136	Delhi
268	412	—	412	136	Punjab
269	200	—	200	136	Punjab
271	400	—	400	135	M.P.
272	6,000	—	6,000	135	M.S.
273	575	—	575	135	W.B.
275	250	250	500	135	Delhi
277	267	—	267	135	Rajasthan
279	340	—	340	135	Delhi
281	500	—	500	135	U.P.
282	186	640	826	135	U.P.
283	250	110	360	134	M.P.
285	65	—	65	134	M.S.
287	600	—	600	134	Madras
290	1,325	—	1,325	134	Delhi
293	1,200	750	1,950	134	U.P.
294	560	—	560	134	U.P.
295	60	—	60	134	U.P.
297	800	3,000	3,800	134	Punjab
298	236	—	236	134	Punjab
299	932	400	1,332	133	M.P.
300	1,250	—	1,250	133	M.S.
301	80	500	580	133	Bihar
302	30	180	210	133	Madras
303	2,500	—	2,500	133	Madras
305	970	—	970	133	Delhi
308	250	—	250	133	U.P.
309	835	—	835	133	U.P.
310	400	—	400	133	Punjab
311	60	50	110	133	U.P.
312	975	—	975	132	M.P.
314	300	—	300	132	M.S.
315	400	210	610	132	M.S.
316	460	—	460	132	Mysore
321	175	—	175	132	Punjab
323	100	—	100	131	M.P.

1	2	3	4	5	6
324	601	—	601	131	M.S.
326	182	—	182	131	Orissa
327	1,500	—	1,500	131	W.B.
328	450	—	450	131	Mysore
329	192	—	192	131	Mysore
330	129	—	129	131	U.P.
331	350	229	579	131	U.P.
332	420	—	420	131	U.P.
333	187	—	187	131	Punjab
334	1,850	—	1,850	130	W.B.
335	1,140	—	1,140	130	Madras
336	400	—	400	130	Goa
337	560	—	560	130	Delhi
338	560	—	560	130	Madras
341	4,920	—	4,920	130	Punjab
342	720	300	1,020	130	Punjab
343	250	—	250	129	Gujrat
344	310	—	310	129	M.P.
345	2,500	—	2,500	129	Orissa
348	525	—	525	129	Mysore
349	590	—	590	129	Rajasthan
350	1,000	—	1,000	129	Delhi
351	227	—	227	129	Delhi
352	950	—	950	129	U.P.
353	298	—	298	129	U.P.
354	190	—	190	129	Punjab

APPENDIX XVII

CORRELATIONAL FIGURES—AT A GLANCE

Table No.	*Specification*	*N*	$(r/r_{pbi}/\phi)$	*Significance level*
1	S.T.S. Total × Minnesota Test	439	0.14	.01
2	S.T.S. Total × Abstract Reasoning Test	441	0.15	.01
3	S.T.S. Total × Bennett Test	425	0.32	.01
4	Abstract Reasoning × Bennett Test	421	0.46	.01
5	Minnesota Test × Abstract Reasoning Test	424	0.47	.01
6	Minnesota Test × Bennett Test	422	0.39	.01
7	Age × Minnesota Test	431	0.03	Not significant
8	Age × Abstract Reasoning Test	433	0.04	,, ,,
9	Age × Bennett Test	417	−0.13	.01
10	Age × S.T.S. marks	532	−0.06	Not significant
11	Age × Physics (High School)	454	−0.003	,, ,,
12	Age × Chemistry (High School)	461	0.002	,, ,,
13	Age × Mathematics (High School)	493	0.03	,, ,,
14	Age × Biology (High School)	168	0.24	.01
15	Age × General Science (High School)	117	−0.19	.05
16	Age × Physics (Higher Secondary)	188	−0.09	Not significant
17	Age × Chemistry (Higher Secondary)	187	−0.07	,, ,,
18	Age × Mathematics (Higher Secondary)	159	−0.01	,, ,,
19	Age × Biology (Higher Secondary)	37	0.12	,, ,,
20	S.T.S. Total × Chemistry (High School)	464	0.07	,, ,,
21	S.T.S. Total × Maths (High School)	497	0.06	,, ,,
22	S.T.S. Total × Biology (High School)	169	0.21	.01
23	Physics (H.S.) × Physics (Higher Secondary)	165	0.23	.01
24	S.T.S. Total × Physics (Higher Secondary)	191	0.22	.01
25	S.T.S. Total × Chemistry (Higher Secondary)	201	0.32	.01
26	S.T.S. Total × Maths (Higher Secondary)	162	0.13	Not significant
27	S.T.S. Total × Physics (High School)	457	0.04	,, ,,
28	Chemistry (H.S.) × Chemistry (Higher Secondary)	169	0.33	.01
29	Maths (H.S.) × Maths (Higher Secondary)	154	0.42	.01
30	Biology (H.S.) × Biology (Higher Secondary)	21	0.64	.01
31	Initiative × Sc. Apt. Test	508	0.15	.01
32	Initiative × Essay	507	0.02	Not significant
33	Initiative × Project Report	490	0.08	.05
34	Initiative × Interview	476	0.02	Not significant
35	Initiative × S.T.S. Total	508	0.13	.01
36	Self-confidence × Sc. Apt. Test	509	0.13	.01

Table No.	*Specification*	*N*	$(r/r_{pbi}/\phi)$	*Significance level*
37	Self-confidence × Essay	508	−0.002	Not significant
38	Self-confidence × Project Report	491	0.02	,, ,,
39	Self-confidence × Interview	477	0.007	,, ,,
40	Self-confidence × S.T.S. Total	509	0.13	.01
41	Aptitude for Sc. × Sc. Apt. Test	509	0.13	.01
42	Aptitude for Sc. × Essay	508	0.066	Not significant
43	Aptitude for Sc. × Project Report	491	−0.05	,, ,,
44	Aptitude for Sc. × Interview	477	−0.04	,, ,,
45	Aptitude for Sc. × S.T.S. Total	509	0.08	.05
46	Scientific Attitude × Sc. Apt. Test	508	0.21	.01
47	Scientific Attitude × Essay	507	−0.003	Not significant
48	Scientific Attitude × Project Report	490	−0.04	,, ,,
49	Scientific Attitude × Interview	476	−0.06	,, ,,
50	Scientific Attitude × S.T.S. Total	508	0.09	.05
51	Inventiveness × Sc. Apt. Test	509	0.15	.01
52	Inventiveness × Essay	508	0.03	Not significant
53	Inventiveness × Project Report	491	0.03	,, ,,
54	Inventiveness × Interview	477	0.02	,, ,,
55	Inventiveness × S.T.S. Total	509	0.07	,, ,,
56	Laboratory Skill × Sc. Apt. Test	509	0.13	,, ,,
57	Laboratory Skill × Essay	508	0.04	,, ,,
58	Laboratory Skill × Project Report	491	0.002	,, ,,
59	Laboratory Skill × Interview	477	0.003	,, ,,
60	Laboratory Skill × S.T.S. Total	509	0.07	,, ,,
61	Science Activity × S.T.S. Total	536	0.09	.05
62	Prizes and awards × S.T.S. Total	536	0.07	Not significant
63	Individual Experimentation × S.T.S. Total	536	0.12	.01
64	Science Literature Studied × S.T.S. Total	536	0.09	.05
65	Level of Aspiration × S.T.S. Total	536	0.06	.05
66	Self-confidence × Lab. Skill	508	0.42 ($x^2 = 89.79$)	Highly significant
67	Scientific Attitude × Inventiveness	508	0.51 ($x^2 = 132.13$)	,,
68	Apt. for Sc. × Scientific Attitude	507	0.57 ($x^2 = 164.04$)	,,
69	Scientific Attitude × Laboratory Skill	508	0.50 ($x^2 = 127.00$)	,,
70	Apt. for Sc. × Inventiveness	508	0.44 ($x^2 = 98.54$)	,,
71	Inventiveness × Lab. Skill	509	0.40 ($x^2 = 81.44$)	,,
72	Apt. for Sc. × Lab. Skill	508	0.58 ($x^2 = 171.23$)	,,
73	Initiative × Self-confidence	509	0.56 ($x^2 = 159.30$)	,,
74	Initiative × Lab. Skill	509	0.34 ($x^2 = 58.72$)	,,
75	Initiative × Apt. for Science	508	0.46 ($x^2 = 107.49$)	,,
76	Self-confidence × Apt. for Science	509	0.48 ($x^2 = 117.27$)	,,
77	Initiative × Scientific Attitude	509	0.43 ($x^2 = 93.74$)	,,
78	Self-confidence × Scientific Attitude	508	0.50 ($x^2 = 127.00$)	,,
79	Initiative × Inventiveness	508	0.50 ($x^2 = 127.00$)	,,
80	Self-confidence × Inventiveness	509	0.54 ($x^2 = 148.41$)	,,

APPENDIX XVII (*Continued*)

TABLE 1

S.T.S. TOTAL × MINNESOTA

Minnesota / *S.T.S. Total*	Class Interval								
	0-8	8-16	16-24	24-32	32-40	40-48	48-56	56-64	*Total*
110-130	4	19	23	28	36	32	11	5	158
130-150	6	14	17	22	38	35	19	5	156
150-170	1	3	7	11	19	22	8	3	74
170-190	—	2	3	2	16	5	3	4	35
190-210	—	—	2	—	4	3	2	—	11
210-230	1	—	—	—	1	—	—	1	3
230-250	—	—	—	—	2	—	—	—	2
Total	12	38	52	63	116	97	43	18	439

$r = 0.14$

The value of '*r*' is significant at .01 level.

TABLE 2

S.T.S. TOTAL × ABSTRACT REASONING

Abs. e asoning / *S.T.S. Total*	Class Interval						
	0-8	8-16	16-24	24-32	32-40	40-48	*Total*
110-130	5	10	26	49	52	10	152
130-150	8	11	20	31	66	24	160
150-170	6	7	1	21	29	13	77
170-190	1	—	3	10	15	7	36
190-210	—	—	—	2	6	3	11
210-230	—	—	—	1	2	—	3
230-250	—	—	—	1	1	—	2
Total	20	28	50	115	171	57	441

$r = 0.15$

The value of '*r*' is significant at .01 level.

TABLE 3

S.T.S. TOTAL × BENNETT MECHANICAL COMPREHENSION TEST

Bennett / *S.T.S. Total*	Class Interval							
	0-8	8-16	16-24	24-32	32-40	40-48	48-56	*Total*
110-130	4	29	45	46	20	5	—	149
130-150	2	21	32	49	37	12	—	153
150-170	—	4	14	24	21	8	3	74
170-190	—	—	8	11	12	3	—	34
190-210	—	—	—	1	5	2	2	10
210-230	—	1	—	1	—	1	—	3
230-250	—	—	—	1	1	—	—	2
Total	6	55	99	133	96	31	5	425

$r = 0.32$

The value of '*r*' is significant at .01 level.

TABLE 4

ABSTRACT REASONING × BENNETT MECHANICAL COMPREHENSION TEST

Bennett / *Abs. Reasoning*	Class Interval							
	0-8	8-16	16-24	24-32	32-40	40-48	48-56	*Total*
0-8	1	4	8	6	1	—	—	20
8-16	1	11	10	4	—	—	—	26
16-24	1	11	18	14	4	—	—	48
24-32	2	16	30	39	18	4	1	110
32-40	1	11	29	56	50	12	4	163
40-48	—	2	2	13	23	14	—	54
48-56	—	—	—	—	—	—	—	—
Total	6	55	97	132	96	30	5	421

$r = 0.46$

The value of '*r*' is significant at .01 level.

TABLE 5

MINNESOTA × ABSTRACT REASONING TEST

Abstract Reasoning	Class Interval						
Minnesota	0-8	8-16	16-24	24-32	32-40	40-48	*Total*
0-8	2	4	3	3	—	—	12
8-16	3	5	9	13	8	—	38
16-24	7	5	12	15	10	3	52
24-32	1	3	14	18	22	3	61
32-40	5	7	5	28	52	13	110
40-48	1	2	6	24	49	11	93
48-56	1	—	—	8	17	14	40
56-64	—	—	—	2	6	10	18
Total	20	26	49	111	164	54	424

$r=0.47$

The value of 'r' is significant at .01 level.

TABLE 6

MINNESOTA × BENNETT MECHANICAL COMPREHENSION TEST

Bennett	Class Interval							
Minnesota	0-8	8-16	16-24	24-32	32-40	40-48	48-56	*Total*
0-8	—	4	4	3	1	—	—	12
8-16	2	10	14	11	1	—	—	38
16-24	2	11	13	18	5	3	—	52
24-32	—	10	20	15	12	3	—	60
32-40	1	11	26	38	26	5	3	110
40-48	—	8	12	34	31	6	1	92
48-56	1	1	8	8	14	7	1	40
56-64	—	—	1	5	6	6	—	18
Total	6	55	98	132	96	30	5	422

$r=0.39$

The value of 'r' is significant at .01 level.

TABLE 7

AGE × MINNESOTA TEST

Minnesota / *Age*	Class Interval								
	0-8	8-16	16-24	24-32	32-40	40-48	48-56	56-64	*Total*
13-14	—	—	—	—	—	—	—	—	—
14-15	3	1	1	1	3	3	1	2	15
15-16	—	6	10	10	20	19	5	—	70
16-17	1	10	17	23	42	36	16	10	155
17-18	4	11	13	15	34	28	18	2	125
18-19	3	9	6	13	12	11	3	—	57
19-20	—	—	2	1	2	—	—	—	5
20-21	1	—	1	—	—	—	—	—	2
21-22	—	—	2	—	—	—	—	—	2
Total	12	37	52	63	113	97	43	14	431

$r = .03$

The value of '*r*' is not significant at .05 level.

TABLE 8

AGE × ABSTRACT REASONING TEST

Abstract Reasoning / *Age*	Class Interval						
	0-8	8-16	16-24	24-32	32-40	40-48	*Total*
13-14	—	—	—	—	—	—	—
14-15	1	1	—	6	5	2	15
15-16	1	3	12	17	31	4	68
16-17	11	8	12	34	67	25	157
17-18	6	7	10	35	48	20	126
18-19	1	7	12	20	15	4	59
19-20	—	1	1	2	—	—	4
20-21	—	—	1	—	1	—	2
21-22	—	—	1	—	1	—	2
Total	20	27	49	114	168	55	433

$r = 0.04$

The value of '*r*' is not significant at .05 level.

TABLE 9

AGE × BENNETT MECHANICAL COMPREHENSION TEST

Bennett / *Age*	Class Interval							
	0-8	8-16	16-24	24-32	32-40	40-48	48-56	*Total*
13-14	—	—	—	—	—	—	—	—
14-15	—	—	2	8	3	2	—	15
15-16	—	9	15	22	14	5	—	65
16-17	—	18	28	53	37	11	2	149
17-18	2	18	27	34	27	11	3	122
18-19	3	7	22	14	11	1	—	58
19-20	—	1	3	—	—	—	—	4
20-21	—	1	1	—	—	—	—	2
21-22	—	—	—	1	1	—	—	2
Total	5	54	98	132	93	30	5	417

$r = -0.13$

The value of '*r*' is significant at .01 level.

TABLE 10

AGE × S.T.S. TOTAL

S.T.S. Total / *Age*	Class Interval									
	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	*Total*
110-130	—	5	42	57	52	30	5	2	2	195
130-150	—	6	32	70	52	27	—	—	1	188
150-170	—	4	9	37	27	10	—	—	—	87
170-190	—	1	6	19	13	4	—	—	—	43
190-210	—	1	2	8	2	—	—	—	—	13
210-230	—	—	—	1	3	—	—	—	—	4
230-250	—	—	—	1	—	1	—	—	—	2
Total	—	17	91	193	149	72	5	2	3	532

$r = -0.06$

The value of '*r*' is not significant at .05 level.

TABLE 11

AGE × PHYSICS (High School)

	Class Inerval								
Physics *Age*	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	*Total*
14-15	—	—	1	6	5	1	3	1	17
15-16	—	—	1	13	25	29	17	2	87
16-17	—	3	5	35	50	42	23	6	164
17-18	—	—	2	32	36	41	10	2	123
18-19	1	—	1	10	12	20	9	2	55
19-20	—	—	—	—	2	—	1	—	3
20-21	—	—	—	—	1	1	—	—	2
21-22	—	—	—	1	—	1	1	—	3
Total	1	3	10	97	131	135	64	13	454

$r = -.003$

The value of '*r*' is not significant at .05 level.

TABLE 12

AGE × CHEMISTRY (High School)

	Class Interval							
Chemistry *Age*	30-40	40-50	50-60	60-70	70-80	80-90	90-100	*Total*
14-15	—	—	5	3	7	2	—	17
15-16	—	2	15	21	28	19	3	88
16-17	—	2	34	51	43	30	4	164
17-18	—	5	20	37	39	22	3	126
18-19	1	1	9	12	20	11	2	56
19-20	—	—	—	3	1	1	—	5
20-21	—	—	—	1	1	—	—	2
21-22	—	—	1	—	2	—	—	3
Total	1	10	84	128	141	85	12	461

$r = .002$

The value of '*r*' is not signicfiant at .05 level.

TABLE 13

AGE × MATHS. (High School)

Maths. *Age*	Class Interval							
	30-40	40-50	50-60	60-70	70-80	80-90	90-100	*Total*
14-15	—	1	3	4	3	2	4	17
15-16	—	—	8	16	12	21	25	82
16-17	1	9	15	27	31	49	49	181
17-18	—	—	13	23	32	37	32	137
18-19	—	—	7	5	19	9	26	66
19-20	—	1	—	1	—	1	2	5
20-21	—	—	1	—	—	1	—	2
21-22	—	1	—	—	1	—	1	3
Total	1	12	47	76	98	120	139	493

$r = .03$

The value of '*r*' is not significant at .05 level.

TABLE 14

AGE × BIOLOGY (High School)

Biology *Age*	Class Interval							
	30-40	40-50	50-60	60-70	70-80	80-90	90-100	*Total*
14-15	—	2	4	1	—	1	—	8
15-16	—	7	16	12	6	1	1	43
16-17	2	3	16	25	7	4	—	57
17-18	—	—	15	18	7	3	1	44
18-19	1	1	2	3	4	1	3	15
19-20	—	—	—	1	—	—	—	1
20-21	—	—	—	—	—	—	—	—
21-22	—	—	—	—	—	—	—	—
Total	3	13	53	60	24	10	5	168

$r = 0.24$

The value of '*r*' is not significant at .01 level.

TABLE 15

AGE × GENERAL SCIENCE (High School)

Gen. Science / *Age*	Class Interval							
	30-40	40-50	50-60	60-70	70-80	80-90	90-100	*Total*
15-16	—	—	3	1	—	1	1	6
16-17	—	—	8	9	18	7	3	45
17-18	—	1	9	6	18	4	1	39
18-19	—	1	5	5	12	—	—	23
19-20	—	—	—	1	1	1	—	3
20-21	—	—	—	—	—	—	—	—
21-22	1	—	—	—	—	—	—	1
Total	1	2	25	22	49	13	5	117

$r = 0.19$

The value of '*r*' is significant at .05 level.

TABLE 16

AGE × PHYSICS (Higher Secondary)

Physics / *Age*	Class Interval							
	30-40	40-50	50-60	60-70	70-80	80-90	90-100	*Total*
14-15	—	—	2	1	1	2	—	6
15-16	1	1	6	8	11	3	1	31
16-17	2	2	8	18	25	15	2	72
17-18	3	5	7	9	14	12	—	50
18-19	1	2	6	9	8	2	—	28
19-20	—	—	—	—	—	—	—	—
20-21	—	—	—	—	—	—	—	—
21-22	—	—	—	—	—	—	—	—
Total	7	10	29	45	59	34	3	187

$r = -0.097$

The value of '*r*' is not significant at .05 level.

TABLE 17

AGE × CHEMISTRY (Higher Secondary)

Chemistry / Age	Class Interval 30-40	40-50	50-60	60-70	70-80	80-90	90-100	*Total*
14-15	—	1	—	—	1	3	1	6
15-16	2	1	5	6	9	9	—	32
16-17	2	—	10	22	22	11	2	69
17-18	—	2	9	15	17	6	1	50
18-19	—	1	4	8	11	3	—	27
19-20	—	—	—	—	—	—	—	—
20-21	—	—	—	—	—	—	—	—
21-22	—	—	—	—	—	—	—	—
Total	4	5	28	51	60	32	4	184

$r = -0.07$

The value of '*r*' is not significant at .05 level.

TABLE 18

AGE × MATHS. (Higher Secondary)

Maths. / Age	Class Interval 30-40	40-50	50-60	60-70	70-80	80-90	90-100	*Total*
14-15	—	1	—	1	1	2	1	6
15-16	2	2	1	5	3	10	6	29
16-17	—	2	7	14	10	15	13	61
17-18	—	3	3		16	7	9	44
18-19	—	2	2	3	3	6	3	19
Total	2	10	13	29	33	40	32	159

$r = -0.01$

The value of '*r*' is not significant at .05 level.

TABLE 19

AGE × BIOLOGY (Higher Secondary)

Biology / *Age*	Class Interval 40-50	50-60	60-70	70-80	80-90	90-100	*Total*
15-16	—	2	—	1	—	—	3
16-17	1	4	4	1	1	—	11
17-18	1	3	4	3	—	—	11
18-19	—	4	5	2	1	—	12
Total	2	13	13	7	2	—	37

$r = 0.12$

The value of '*r*' is not significant at .05 level.

TABLE 20

S.T.S. TOTAL × CHEMISTRY (High School)

Chemistry / *S.T.S. Total*	Class Interval 30-40	40-50	50-60	60-70	70-80	80-90	90-100	*Total*
110-130	—	2	29	48	53	29	5	166
130-150	1	6	35	47	34	35	4	162
150-170	—	2	15	23	31	9	—	80
170-190	—	—	3	6	20	8	1	38
190-210	—	—	2	4	3	2	1	12
210-230	—	—	—	1	1	2	—	4
230-250	—	—	—	—	—	1	1	2
Total	1	10	84	129	142	86	12	464

$r = 0.07$

The value of '*r*' is not significant at .05 level.

TABLE 21

S.T.S. TOTAL × MATHS. (High School)

Maths.	Class Interval							
S.T.S. Total	30-40	40-50	50-60	60-70	70-80	80-90	90-100	*Total*
110-130	—	4	17	30	36	44	54	185
130-150	1	6	19	22	40	46	43	177
150-170	—	1	7	16	14	20	17	75
170-190	—	1	2	8	7	7	17	42
190-210	—	—	2	—	1	4	5	12
210-230	—	—	—	1	—	—	3	4
230-250	—	—	—	—	—	—	2	2
Total	1	12	47	77	98	121	141	497

$r = 0.06$

The value of '*r*' is not significant at 0.5 level.

TABLE 22

S.T.S. TOTAL × BIOLOGY (High School)

Biology	Class Interval							
S.T.S. Total	30-40	40-50	50-60	60-70	70-80	80-90	90-100	*Total*
110-130	—	8	24	18	7	2	—	59
130-150	2	3	13	26	11	2	3	60
150-170	1	2	8	13	4	3	—	31
170-190	—	—	6	1	1	3	1	12
190-210	—	—	2	2	—	—	—	4
210-230	—	—	—	1	1	—	—	2
230-250	—	—	—	—	—	—	1	1
Total	3	13	53	61	24	10	5	169

$r = 0.21$

The value of '*r*' is significant at .01 level.

TABLE 23

PHYSICS (High School) × PHYSICS (Higher Secondary)

Physics Hr. Secondary / *Physics High School*	Class Interval								
	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	*Total*
20-30	—	—	—	1	—	—	—	—	1
30-40	—	—	—	1	—	—	—	—	1
40-50	—	—	—	2	—	—	1	—	3
50-60	—	—	4	6	9	5	5	1	30
60-70	1	2	3	8	10	17	8	—	49
70-80	—	—	2	5	13	17	8	—	45
80-90	—	1	1	1	7	14	5	—	29
90-100	—	—	—	1	1	1	2	2	7
Total	1	3	10	25	40	54	29	3	165

$r = 0.23$

The value of 'r' is significant at .01 level.

TABLE 24

S.T.S. TOTAL × PHYSICS (Higher Secondary)

Phy. Hr. Secondary / *S.T.S. Total*	Class Interval								
	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	Total
110-130			1	2	2	5	—	—	10
130-150	1	3	6	24	28	26	16	2	106
150-170	—	—	2	4	8	20	10	1	45
170-190	—	—	1	3	5	7	4	1	21
190-210	—	—	—	—	2	1	3	—	6
210-230	—	—	—	—	—	1	1	—	2
230-250	—	—	—	—	—	1	—	—	1
Total	1	3	10	33	45	61	34	4	191

$r = 0.22$

The value of 'r' is significant at .01 level.

TABLE 25

S.T.S. TOTAL × CHEMISTRY (Higher Secondary)

Chem. Hr. Secondary	Class Interval							
S.T.S. Total	30-40	40-50	50-60	60-70	70-80	80-90	90-100	*Total*
110-130	—	—	1	5	6	4	—	16
130-150	3	5	18	34	27	12	3	102
150-170	—	—	6	11	17	11	1	46
170-190	1	—	3	3	11	4	—	22
190-210	—	—	—	1	1	3	8	13
210-230	—	—	—	—	—	1	—	1
230-250	—	—	—	—	—	1	—	1
Total	4	5	28	54	62	36	12	201

$r = 0.32$

The value of 'r' is significant at .01.

TABLE 26

S.T.S. TOTAL × MATHS. (Higher Secondary)

Maths. Hr. Secondary	Class Interval							
S.T.S. Total	30-40	40-50	50-60	60-70	70-80	80-90	90-100	*Total*
110-130	1	—	—	—	2	4	—	7
130-150	1	7	11	14	17	21	18	89
150-170	—	2	1	11	8	10	7	39
170-190	—	1	1	4	5	3	4	18
190-210	—	—	—	—	1	2	3	6
210-230	—	—	—	—	1	—	1	2
230-250	—	—	—	—	1	—	—	1
Total	2	10	13	29	35	40	33	162

$r = 0.130$

The value of 'r' is not significant at .05 level.

TABLE 27

S.T.S. TOTAL × PHYSICS (High Schoool)

Physics High School	Class Interval								
S.T.S. Total	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	*Total*
110-130	—	1	2	39	42	56	20	4	164
130-150	1	—	5	31	52	43	20	7	159
150-170	—	2	1	16	25	18	17	1	80
170-190	—	—	—	8	8	13	7	1	37
190-210	—	—	2	3	3	4	—	—	12
210-230	—	—	—	—	1	1	2	—	4
230-250	—	—	—	—	—	1	—	—	1
Total	1	3	10	97	131	136	66	13	457

$r = 0.04$

The value of '*r*' is not significant at .05 level.

TABLE 28

CHEMISTRY (High School) × CHEMISTRY (Higher Secondary)

Chem. Hr. Sec.	Class Interval						
Chem. High School	30-40	40-50	50-60	60-70	70-80	80-90	90-100	*Total*
30-40	—	—	—	1	—	—	—	1
40-50	—	1	1	—	1	—	—	3
50-60	1	—	13	9	6	4	—	33
60-70	1	2	6	17	19	5	—	50
70-80	1	1	2	13	15	13	—	45
80-90	—	—	4	5	13	9	3	34
90-100	1	—	—	—	—	1	1	3
Total	4	4	26	45	54	32	4	169

$r = 0{\cdot}33$

The value of '*r*' is significant at ·01 level.

TABLE 29

MATHS. (High School) × MATHS. (Higher Secondary)

Maths. Hr. Sec. / *Maths. High School*	Class Interval							
	30-40	40-50	50-60	60-70	70-80	80-90	90-100	*Total*
40-50	—	—	1	2	—	—	1	4
50-60	—	2	2	4	3	1	—	12
60-70	1	2	4	7	7	4	1	26
70-80	—	3	2	6	6	2	6	25
80-90	1	2	3	5	9	13	4	37
90-100	—	1	—	4	9	18	18	50
Total	2	10	12	28	34	38	30	154

$r = 0.42$

The value of '*r*' is significant at .01 level.

TABLE 30

BIOLOGY (High School) × BIOLOGY (Higher Secondary)

Bio. Hr. Sec. / *Bio. High School*	Class Interval					
	40-50	50-60	60-70	70-80	80-90	*Total*
30-40	—	1	—	—	—	1
40-50	—	1	—	—	—	1
50-60	1	3	4	1	—	9
60-70	1	1	—	—	—	2
70-80	—	—	2	—	—	2
80-90	—	—	2	2	1	5
90-100	—	—	—	—	1	1
Total	2	6	8	3	2	21

$r = 0.64$

The value of '*r*' is significant at .01 level.

TABLE 31

INITIATIVE × SCIENCE APTITUDE TEST

Sc. Apt. Test / *Initiative*	Class Interval						
	20-40	40-60	60-80	80-100	100-120	120-140	*Total*
0	4	28	26	16	—	—	74
1	6	114	165	114	30	5	434
Total	10	142	191	130	30	5	508

$r_{pbi} = 0.15$

The value of '*r*' is significant at .01 level.

TABLE 32

INITIATIVE × ESSAY

Essay / *Initiative*	Class Interval					
	0-10	10-20	20-30	30-40	40-50	*Total*
0	—	9	31	31	3	74
1	4	51	167	179	32	433
Total	4	60	198	210	35	507

$r_{pbi} = 0.02$

The value of '*r*' is significant at 0.05 level.

TABLE 33

INITIATIVE × PROJECT REPORT

Project Report / *Initiative*	Class Interval				
	0-6	6-12	12-18	18-24	*Total*
0	2	48	20	1	71
1	16	227	163	13	419
Total	18	275	183	14	490

$r_{pbi} = 0.08$

The value of '*r*' is significant at .05 level.

TABLE 34

INITIATIVE × INTERVIEW

Interview *Initiative*	Class Interval						
	10-20	20-30	30-40	40-50	50-60	60-70	*Total*
0	10	16	22	16	7	2	73
1	52	100	106	81	46	18	403
Total	62	116	128	97	53	20	476

$r_{pbi} = 0.02$

The value of '*r*' is not significant at .05 level.

TABLE 35

INITIATIVE × S.T.S. TOTAL

S.T.S. Total *Initiative*	Class Interval							
	110-130	130-150	150-170	170-190	190-210	210-230	230-250	*Total*
0	32	32	7	3	—	—	—	74
1	152	150	75	39	13	4	1	434
Total	184	182	82	42	13	4	1	508

$r_{pbi} = 0.13$

The value of '*r*' is significant at .01 level.

TABLE 36

SELF CONFIDENCE × SCIENCE APTITUDE TEST

Sc. Apt. Test *Self Confidence*	Class Interval						
	20-40	40-60	60-80	80-100	100-120	120-140	*Total*
0	4	26	29	16	1	—	76
1	6	117	162	114	29	5	433
Total	10	143	191	130	30	5	509

$r_{pbi} = 0.13$

The value of '*r*' is significant at .01 level.

TABLE 37

SELF CONFIDENCE × ESSAY

Essay	Class Interval					
Self Confidence	0-10	10-20	20-30	30-40	40-50	*Total*
0	—	11	26	35	4	76
1	4	49	173	175	31	432
Total	4	60	199	210	35	508

$r_{pbi} = -0.002$

The value of '*r*' is not significant at .05 level.

TABLE 38

SELF CONFIDENCE × PROJECT REPORT

Project Report	Class Interval				
Self Confidence	0-6	6-12	12-18	18-24	*Total*
0	1	46	26	1	74
1	17	230	157	13	417
Total	18	276	183	14	491

$r_{pbi} = 0.02$

The value of '*r*' is not significant at .05 level.

TABLE 39

SELF CONFIDENCE × INTERVIEW

Interview	Class Interval						
Self Confidence	10-20	20-30	30-40	40-50	50-60	60-70	*Total*
0	9	16	21	18	9	—	73
1	53	100	107	80	44	20	404
Total	62	116	128	98	53	20	477

$r_{pbi} = 0.007$

The value of '*r*' is significant at .05 level.

TABLE 40

SELF CONFIDENCE × S.T.S. TOTAL

S.T.S. Total / *Self Confidence*	Class Interval							
	110-130	130-150	150-170	170-190	190-210	210-230	230-250	*Total*
0	35	27	10	3	1	—	—	76
1	149	156	72	39	12	4	1	433
Total	184	183	82	42	13	4	1	509

$r_{pbi} = 0.13$

The value of '*r*' is not significant at .01 level.

TABLE 41

APTITUDE FOR SCIENCE × SCIENCE APTITUDE TEST

Sc. Apt. Test / *Apt. for Sc.*	Class Interval						
	20-40	40-60	60-80	80-100	100-120	120-140	*Total*
0	1	20	16	7	—	—	44
1	9	123	175	123	30	5	465
Total	10	143	191	130	30	5	509

$r_{pbi} = 0.13$

The value of '*r*' is significant at .01 level.

TABLE 42

APTITUDE FOR SCIENCE × ESSAY

Essay / *Apt. for Sc.*	Class Interval					
	0-10	10-20	20-30	30-40	40-50	*Total*
0	—	8	19	17	—	44
1	4	52	180	193	35	464
Total	4	60	199	210	35	508

$r_{pbi} = 0.066$

The value of '*r*' is not significant at .05 level.

TABLE 43

APTITUDE FOR SCIENCE × PROJECT REPORT

Project Report / *Apt. for Science*	Class Interval				
	0-6	6-12	12-18	18-24	*Total*
0	—	23	17	1	41
1	18	253	166	13	450
Total	18	276	183	14	491

$$r_{pbi} = -0.05$$

The value of '*r*' is not significant at .05 level.

TABLE 44

APTITUDE FOR SCIENCE × INTERVIEW

Interview / *Apt. for Science*	Class Interval						
	10-20	20-30	30-40	40-50	50-60	60-70	*Total*
0	2	10	11	14	6	—	43
1	60	106	117	84	47	20	434
Total	62	116	128	98	53	20	477

$$r_{pbi} = -0.04$$

The value of '*r*' is not significant at .05 level.

TABLE 45

APTITUDE FOR SCIENCE × S.T.S. TOTAL

S.T.S. Total / *Apt. for Science*	Class Interval							
	110-130	130-150	150-170	170-190	190-210	210-230	230-250	*Total*
0	20	15	7	2	—	—	—	44
1	164	168	75	40	13	4	1	465
Total	184	183	82	42	13	4	1	509

$$r_{pbi} = 0.08$$

The value of '*r*' is significant at .05 level.

TABLE 46

SCIENTIFIC ATTITUDE × SCIENCE APTITUDE TEST

Sc. Apt. Test / *Scientific Attitude*	Class Interval						
	20-40	40-60	60-80	80-100	100-120	120-140	*Total*
0	4	27	22	6	—	—	59
1	6	116	168	124	30	5	449
Total	10	143	190	130	30	5	508

$r_{pbi} = 0.21$

The value of '*r*' is significant at .01 level.

TABLE 47

SCIENTIFIC ATTITUDE × ESSAY

Essay / *Scientific Attitude*	Class Interval					
	0-10	10-20	20-30	30-40	40-50	*Total*
0	—	9	21	24	5	59
1	4	51	178	185	30	448
Total	4	60	199	209	35	507

$r_{pbi} = -0.003$

The value of '*r*' is not significant at .05 level.

TABLE 48

SCIENTIFIC ATTITUDE × PROJECT REPORT

Project Report / *Sc. Attitude*	Class Interval				
	0-6	6-12	12-18	18-24	*Total*
0	—	33	21	2	56
1	18	243	161	12	434
Total	18	276	182	14	490

$r_{pbi} = -0.04$

The value of '*r*' is not significant at .05 level.

TABLE 49

SCIENTIFIC ATTITUDE × INTERVIEW

Interview / *Sc. Attitude*	Class Interval						
	10-20	20-30	30-40	40-50	50-60	60-70	*Total*
0	3	12	16	17	9	—	57
1	58	104	112	81	44	20	419
Total	61	116	128	98	53	20	476

$$r_{pbi} = -0.06$$

The value of '*r*' is not significant at .05 level.

TABLE 50

SCIENTIFIC ATTITUDE × S.T.S. TOTAL

S.T.S. Total / *Sc. Attitude*	Class Interval							
	110-130	130-150	150-270	170-190	190-210	210-230	230-250	*Total*
0	25	24	7	3	—	—	—	59
1	159	158	75	39	13	4	1	449
Total	184	182	82	42	13	4	1	508

$$r_{pbi} = 0.09$$

The value of '*r*' is significant at .05 level.

TABLE 51

INVENTIVENESS × SCIENCE APTITUDE TEST

Sc. Apt. Test / *Inventiveness*	Class Interval						
	20-40	40-60	60-80	80-100	100-120	120-140	*Total*
0	3	41	45	26	—	—	115
1	7	102	146	104	30	5	394
Total	10	143	191	130	30	5	509

$$r_{pbi} = 0.15$$

The value of '*r*' is significant at .01 level.

TABLE 52

INVENTIVENESS × ESSAY

Essay / *Inventiveness*	Class Interval					
	0-10	10-20	20-30	30-40	40-50	*Total*
0	—	12	50	45	8	115
1	4	48	149	165	27	393
Total	4	60	199	210	35	508

$r_{pbi} = 0.03$

The value of '*r*' is not significant at .05 level.

TABLE 53

INVENTIVENESS × PROJECT RREPORT

Project Report / *Inventiveness*	Class Interval				
	0-6	6-12	12-18	18-24	*Total*
0	4	66	35	4	109
	14	210	148	10	382
Total	18	276	183	14	491

$r_{pbi}=0.03$

The value of '*r*' is not significant at .05 level.

TABLE 54

INVENTIVENEES × INTERVIEW

Interview / *Inventiveness*	Class Interval						
	10-20	20-30	30-40	40-50	50-60	60-70	*Total*
0	16	26	29	27	11	3	112
1	46	90	99	71	42	17	365
Total	62	116	128	98	53	20	477

$r_{pbi}=0.02$

The value of '*r*' is not significant at .05 level.

TABLE 55

INVENTIVENESS × S.T.S. TOTAL

S.T.S. Total / *Inventiveness*	Class Interval							*Total*
	110-130	130-150	150-170	170-190	190-210	210-230	230-250	
0	43	49	17	6	—	—	—	115
1	141	134	65	36	13	4	1	394
Total	184	183	82	42	13	4	1	509

$r_{phi}=0.07$

The value of '*r*' is not significant at .05 level.

TABLE 56

LABORATORY SKILL × SCIENCE APTITUDE TEST

Sc. Apt. Test / *Lab. Skill*	Class Interval						*Total*
	20-40	40-60	60-80	80-100	100-120	120-140	
0	3	19	22	9	—	—	53
1	7	124	169	121	30	5	456
Total	10	143	191	130	30	5	509

$r_{bpi}=0.07$

The value of '*r*' is not significant at .05 level.

TABLE 57

LABORATORY SKILL × ESSAY

Essay / *Lab. Skill*	Class Interval					*Total*
	0-10	10-20	20-30	30-40	40-50	
0	—	9	21	20	3	53
1	4	51	178	190	32	455
Total	4	60	199	210	35	508

$r_{pbi}=0.04$

The value of '*r*' is not significant at .05 level.

TABLE 58

LABORATORY SKILL × PROJECT REPORT

Project Report *Lab. Skill*	Class Interval				
	0-6	6-12	12-18	18-24	*Total*
0	1	31	16	2	50
1	17	245	167	12	441
Total	18	276	183	14	491

$r_{pbi}=0.002$

The value of '*r*' is not significant at .05 level.

TABLE 59

LABORATORY SKILL × INTERVIEW

Interview *Lab. Skill*	Class Interval						
	10-20	20-30	30-40	40-50	50-60	60-70	*Total*
0	5	14	10	13	10	—	52
1	57	102	118	85	43	20	425
Total	62	116	128	98	53	20	477

$r_{pbi}=0.003$

The value of '*r*' is not significant at 0.5 level.

TABLE 60

LABORATORY SKILL × S.T.S. TOTAL

S.T.S. Total *Lab. Skill*	Class Interval							
	110-130	130-150	150-170	170-190	190-210	210-230	230-250	*Total*
0	22	21	6	4	—	—	—	53
1	162	162	76	38	13	4	1	456
Total	184	183	82	42	13	4	1	509

$r_{pbi}=0.07$

The value of '*r*' is not significant at .05 level.

TABLE 61

SCIENCE ACTIVITIES × S.T.S. TOTAL

S.T.S. Total	Class Interval							
Sc. Activities.	110-130	130-150	150-170	170-190	190-210	210-230	230-250	Total
0	66	62	24	13	—	—	1	166
1	131	127	63	31	13	4	1	370
Total	197	189	87	44	13	4	2	536

$r_{pbi} = 0.09$

The value of '*r*' is not sigcificant at .05 level.

TABLE 62

PRIZES AND AWARDS × S.T.S. TOTAL

S.T.S. Total	Class Interval							
Prizes & Awards	110-130	130-150	150-170	170-190	190-210	210-230	230-250	Total
0	125	106	45	25	9	—	1	311
1	72	83	42	19	4	4	1	225
Total	197	189	87	44	13	4	2	536

$r_{pbi} = 0.07$

The value of '*r*' is not significant at 0.5 level.

TABLE 63

INDIVIDUAL EXPERIMENTS × S.T.S. TOTAL

S.T.S. Total	Class Interval							
Ind. Expts.	110-130	130-150	150-170	170-190	190-210	210-230	230-250	Total
0	80	71	26	10	4	—	—	191
1	117	118	61	34	9	4	2	345
Total	197	189	87	44	13	4	2	536

$r_{pbi} = 0.12$

The value of '*r*' is significant at .01 level.

TABLE 64

SCIENCE LITERATURE × S.T.S. TOTAL

S.T.S. Total / *Sc.Literature*	Class Interval							
	110-130	130-150	150-170	170-190	190-210	210-230	230-250	Total
0	21	15	6	1	—	—	—	43
1	176	174	81	43	13	4	2	493
Total	197	189	87	44	13	4	2	536

$r_{pbi} = 0.09$

The value of '*r*' is significant at .05 level.

TABLE 65

LEVEL OF ASPIRATION × S.T.S. TOTAL

S.T.S. Total / *Level of Aspiration*	Class Interval							
	110-130	130-150	150-170	170-190	190-210	210-230	230-250	Total
0	16	22	3	2	1	—	—	44
1	181	167	84	42	12	4	2	492
Total	197	18	87	44	13	4	2	536

$r_{pbi} = 0.06$

The value of '*r*' is not significant at .05 leve

TABLE 66

INITIATIVE × SELF CONFIDENCE

Self Confidence / *Initiative*	0	1	Total
0	47	27	74
1	39	405	434
Total	76	432	508

$\phi = 0.56$

The value is significant at .01 level.

TABLE 67

INITIATIVE × APTITUDE FOR SCIENCE

Apt. for Sc. / *Initiative*	0	1	Total
0	29	45	74
1	14		434
Total	43	465	508

$\phi = 0.46$

The value is significant at .01 level.

TABLE 68

INITIATIVE × SCIENTIFIC ATTITUDE

Sc. Attitude / *Initiative*	0	1	Total
0	33	41	74
1	25	408	433
Total	58	449	507

$\phi = 0.43$

The value is significant at .01 level.

TABLE 69

INITIATIVE × INVENTIVENESS

Inventiveness / *Initiative*	0	1	Total
0	54	20	74
1	60	374	434
Total	114	394	508

$\phi = 0.50$

The value is significant at .01 level.

TABLE 70

INITIATIVE × LABORATORY SKILL

Lab. Skill *Initiative*	0	1	Total
0	30	44	74
1	23	411	434
Total	53	455	508

$\phi = 0.34$

The value is significant at .01 level.

TABLE 71

SELF CONFIDENCE × APTITUDE FOR SCIENCE

Apt. for Science *Self Confidence*	0	1	Total
0	31	45	76
1	13	420	433
Total	44	465	509

$\phi = 0.48$

The value is significant at .01 level.

TABLE 72

SELF CONFIDENCE × SCIENTIFIC ATTITUDE

Sc. Attitude *Self Confidence*	0	1	Total
0	38	38	76
1	21	411	432
Total	59	449	508

$\phi = 0.50$

The value is significant as .01 level.

TABLE 73

SELF CONFIDENCE × INVENTIVENESS

Inventiveness *Self Confidence*	0	1	Total
0	58	18	76
1	57	376	433
Total	115	394	509

$\phi = 0.54$

The value is significant at .01 level.

TABLE 74

SELF CONFIDENCE × LABORATORY SKILL

Lab. Skill *Self Confidence*	0	1	Total
0	31	45	76
1	22	411	433
Total	53	456	509

$\phi = 0.42$

The value is significant at .01 level.

TABLE 75

APTITUDE FOR SCIENCE × SCIENTIFIC ATTITUDE

Sc. Attitude *Apt. for Sc.*	0	1	Total
0	31	13	44
1	28	436	464
Total	59	449	508

$\phi = 0.57$

The value is significant at .01 level.

TABLE 76

APTITUDE FOR SCIENCE × INVENTIVENESS

Inventiveness *Apt. for Sc.*	0	1	Total
0	36	8	44
1	79	386	465
Total	115	394	509

$\phi = 0.44$

The value is significant at .01 level.

TABLE 77

APTITUDE FOR SCIENCE × LABORATORY SKILL

Lab. Skill *Apt. for Sc.*	0	1	Total
0	30	14	44
1	23	442	465
Total	53	456	509

$\phi = 0.58$

The value is significant at .01 level.

TABLE 78

SCIENTIFIC ATTITUDE × INVENTIVENESS

Inventiveness *Sc. Attitude*	0	1	Total
0	48	11	59
1	66	383	449
Total	114	394	508

$\phi = 0.51$

The value is significant at .01 level.

TABLE 79

SCIENTIFIC ATTITUDE × LABORATORY SKILL

Lab. Skill / *Sc. Attitude*		1	Total
0	31	28	59
1	22	427	449
Total	53	455	508

$\phi = 0.50$

The value is significant at .01 level.

TABLE 80

INVENTIVENESS × LABORATORY SKILL

Lab. Skill / *Inventiveness*	0	1	Total
0	38	77	115
1	15	379	394
Total	53	456	509

$\phi = 0.40$

The value is significant at .01 level.

Other 1964 Publications in this Series

ESSAYS BY YOUNG SCIENTISTS—HINDI
ESSAYS BY YOUNG SCIENTISTS—ENGLISH
ESSAYS BY YOUNG SCIENTISTS—REGIONAL LANGUAGES
PROJECT REPORTS BY YOUNG SCIENTISTS
SCIENTISTS OF TOMORROW